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Issue 5 - February 2005

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## COMMENT

Well, here we are with issue 5, my, how time flies. It doesn't seem that long ago when I was writing the comment for the launch issue of International Fire Fighter and here I am 15 months on, well into the second year of publication. This year is going to prove to be just as exciting as 2004 and I would please urge you to continue sending in your comments about International Fire Fighter (still nothing negative) and also ideas about future issues.

If any of our readers or advertisers would be interested in submitting any articles for future use, I would be delighted to hear from you and discuss these possibilities. I am looking forward to meeting friends old and new in Indianapolis and Hannover later this year. We will be exhibiting at the FDIC and Interschutz so please pop by our booth for a chat.

**Mark Bathard**  
Sales and Editorial Manager





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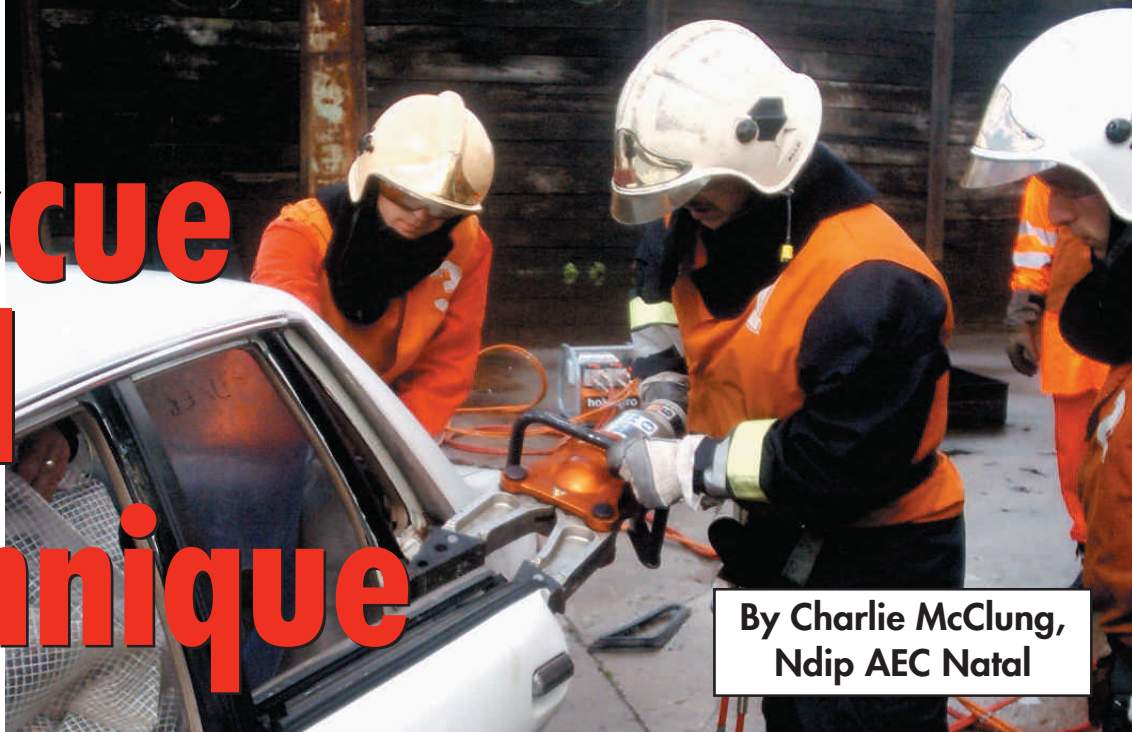


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# Rescue tool technique



By Charlie McClung,  
Ndip AEC Natal

Pic courtesy of ICET BV

## SAFE RESCUE EQUIPMENT OPERATION

### Know your equipment

OPERATING RESCUE EQUIPMENT REQUIRES sufficient training. We often find that operators are not fully aware of the capabilities of such equipment and the possible reactions as a result of their use. Knowledge of hydraulics basics and how the system works is essential for all rescuers as it enhances safety, prevents tool damage and in the event of a mishap trouble shooting can be effected in remote areas where maintenance technicians are not available.

Due to technical developments our tools are inherently lighter, but at the same time stronger. Lightweight cutters can develop cutting forces of over 30 tons! Using this extreme force on any piece of metal, can cause a sudden reaction to both the material and the cutter involved.

The working forces exerted by spreaders and rams can also create dangerous situations if one is not used to working with these kinds of forces. In this article I will discuss some technicalities concerning cutting, spreading and ramming. Due to the variety of accident scenes, it is impossible to prescribe how to deal with each situation. I can however present some general rules which will provide guidance for the safe operation of rescue equipment for both the operator and the victim(s).

All squad members should of course be adequately protected. Full bunker

gear or overalls, gloves and boots must be worn. Helmets with attached visors should be complimented with additional eye protection. We also need to look at all kinds of possible hazards, such as oncoming traffic, glass, sharp metal etc.

### OPERATING DIFFERENT TYPES OF CUTTERS

#### The standard cutter (Parrot beak)

The standard cutter was mainly developed to cut the roof posts of cars and trucks. Operating these cutters is relatively easy if we bear in mind some basic rules:

- place the cutter onto the object at a 90 degree angle.
- during the cutting process the cutter may move in any direction, taking the least line of resistance, be prepared for this action.

- allow the tool to move, do not attempt to forcibly hold the tool in the original position. This may place unnecessary stress on the blades.
- in addition, no operator is strong enough to resist the forces exerted by the tool and attempting to do so takes his/her mind off the really important issues.
- the operator should constantly observe the cutter and its movement.
- Make sure that whatever is being cut is also being held or supported to prevent injury to the user/victim from flying bits of metal or a door or roof falling down.
- Before cutting, always inspect what you intend to cut and during the process observe the tips of the cutter as they may separate and/or cross over causing damage. With increased strengths of motor vehicles this is more likely to occur.
- If the cutter moves in a direction where it may endanger the safety of the operator or anyone else, the dead man's handle should be released immediately or turned to the opposite position.
- The cutter's action should also be stopped immediately if the cutter comes into contact with a part of the car. This situation could jeopardize





Pic courtesy of ICET BV

the operators hands or if continued could cause severe damage to the tool.

- In both situations, the cutting action should be renewed from a different angle.
- Solid parts such as bars and hinges should be cut in the recess of the blades. If substantial structures like hinges have to be cut by the normal blade opening, the operator should watch the movement of the blades extra carefully. One could say that if the blades stay together the cutting action is O.K. If the blades start to separate or cross over, the action should be stopped and reversed immediately to prevent damage or breakage of the blades.

#### CUTTING WITH THE STRAIGHT-BLADED CUTTER

The shape of the blades of these cutters is completely different from the parrot beak cutter. The cutting edge of the blades is bigger and therefore it is usual for these tools to twist while they are carrying out a cutting action. Again, one should allow this movement of the tool, as long as no dangerous situation occurs.

As always, but especially in the case of these strong cutters, someone should assist the tool operator. This “buddy”, who is of course also fully protected, must take care that parts which have been cut off cannot cause dangerous situations. When a cut off

part is supported by the (gloved!) hand of an assistant, the reaction is mostly minimal.

Of course assistance is also needed to support a roof, for instance when the roof parts are cut. These cutters are specially suited to cut solid steel parts, such as you would be likely to encounter in heavy trucks or trains. The cutter should be inserted as deep as possible, since the cutter is strongest near the hinge point and here also, one should always watch the blades when cutting something. When the blades move apart, the action should be stopped!!

#### Hybrid blades

Cutters are now being produced with a combination of parrot and straight blades, these cutters do not move predictably when being used (full rotation of a smooth parrot beak) and the cutting action needs to be watched more closely for blade separation.

#### USING HYDRAULIC SPREADERS

##### *Forced door displacement:*

Most spreaders have very thin and well serrated tips with a good grip. Therefore it is relatively easy to get the spreader into a door opening without jamming or bumping. If getting the tips in is proving difficult the use a door squeeze or other technique such as a fender crush to gain a purchase point for the spreader tips.

The aim is to get as close to the

hinge or lock as possible with the tips in order to roll the door off the hinge or nader bolt or break it. In this way you can avoid causing a lot of torn out sharp sheet metal.

#### General rules:

1. One of the team should support the door to prevent it from shooting away.
2. This member should always take up a position beside the door and never in the path where the door is expected to be displaced. (Anticipate the action)
3. The spreader should always be located above the upper hinge and then above the lower hinge in order to roll the door off the hinges down and away from the rescuer and casualty.
4. During the spreading operation the operator must take care not to be caught between the spreader and the side of the vehicle.
5. Correct body positioning will alleviate being injured or damage to the operator's back.

Beside opening doors, spreaders can be useful in many other ways when making space, such as pushing a chair backward or forward, lifting a dashboard, pulling a steering column etc.

Sometimes a spreader is also used to lift all kind of obstacles such as cars, trucks or heavy machinery. Although the capacity of most spreaders is more than sufficient to lift most of these objects, we discourage the use of a spreader as a lifting tool. The tips of the spreaders are not very wide and for that reason they are not suitable to lift loads, and can cause instability especially on uneven ground. If however a spreader is used for lifting purposes in an emergency, one should look for solid parts to insert the spreader into, increase the surface area of the tips by means of wooden blocks and support the load with stabilisation material continuously, both during and after lifting.

#### USING HYDRAULIC RAMS

The rams are mostly used to create space around an entrapped casualty in techniques such as a dash roll or dash lift. Following a side impact the rams can be used to cross ram doors away





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### *Cutting equipment, blade:*

Diameter	350 mm (14")/300 mm (12")
Cutting depth	125 mm (5")/100 mm (4")

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from a casualty. Rams could also be used to lift or support a crushed in roof. Rams that can have chain adapters attached can also be used for pulling actions such as pulling a vehicle out from under a truck.

The rams are available in varying capacities and lengths depending on manufacturer. Some models can be used with extension pipes to increase the length. The extension-pipes cannot and may not be used on the plunger side of the ram because of the increased danger of bending the plunger. There are telescopic rams also available on the market these vary in length and power. Of course the ideal situation is to have a complete series of rams available to fit into every possible situation.

### General operating rules:

1. Always try to place the load on the ram into the centre of the plunger.
2. Place cribbing under the area you intend to push off. (The use of a ram support will spread the load and offer you varying lengths and angles from which to push)
3. Place the heads of the ram on solid material that will not tear during the push. (A hinge or strengthened support is a good site.)
4. Guard against the ram slipping out as a lot of energy it released.
5. The operator must be an arms length away from the tool and preferably behind it. (This is to prevent him/her being injured should the ram spring free unexpectedly)
6. Use two members during the operation, one watches the progression of the push at the head of the ram and the other to watch the base of the ram and the effect of the push on the pillar or floor of the vehicle.
7. As the push is being effected monitor the movement of the vehicle and crib as necessary.
8. Good strategic cutting prior to the push will not only make it easier to push but will also enable you to move the metal in the direction you want it to go.

Rams are the most effective way of removing dashboards away from casualties and are preferred to pulling with chains. (However the latter remains an option in certain situations.)



Pic courtesy of ICET BV

### LIFTING BAGS

There are two types of lifting air bags.

- The first type is the **HIGH PRESSURE LIFTING BAG**, this bag operates up to a maximum pressure of 8 bar.
- The second type is the **LOW PRESSURE LIFTING BAG**, this bag operates up to a maximum pressure of .5 bar.

Pascal's law applies in the case of both high and low pressure bags;

this being  $\text{Pressure} \times \text{Surface area} = \text{Lifting Force}$ .

So why do we have two types of air bags?

Both bags have their advantages and disadvantages

- The high pressure bags have a starting height of only 25mm but a smaller lifting height, the Low pressure bag starts at 60mm, but a much larger lifting height.
- The High pressure bag can be placed into very small spaces to begin the lift.
- The high pressure bag can lift larger weights of up to 67 tons in some models. The Low pressure bag can lift weights of up to 16 tons depending on make.
- The Low pressure bag will lift weights of up to 16 tons for the

full stroke of the bag, this being 620 mm in some makes, whilst the High pressure bag will lift 67 tons only for a few cm and then, as the surface area of the bags decreases, the lifting force will diminish proportionately.

### Operating the lifting bags

Points to remember

1. "Pack as you jack". You must never take the risk of lifting a load without placing cribbing under the load as you lift. If the load should move or the bag deflate, then the cribbing will support the load.
2. For the best and safest lift ensure that the bag is totally under the load. A bag which is half under the load will give you only half the lifting capacity of the bag and will cause a sideways lift of the load.
3. Always use two bags together for a stable lift.
4. Never place cribbing on top of the bag as there is a chance that as the bag inflates the cribbing could be ejected with great force.
5. To provide the greatest degree of lift, the bag should be placed as close as possible to the load that is to be lifted. If the space between the two surfaces is too great, ensure that this space is filled UNDER the bag until the bag is flush with the load.



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Pic courtesy of ICET BV

6. With high pressure bags that do not lock together, never use more than two bags on top of each other as the middle bag will be displaced with force and a bad situation will result

### Hand tools

All sorts of hand tools are in use in the course of rescue work. Many of the smaller hand tools are normally part of a personal toolkit and are kept in a tool pouch which is worn around the fire fighter's waist. Inside such a pouch you might find: pliers, knife, screwdriver, tape measure, centre punch and seat belt cutters. The idea of this tool set is that the fire fighter does not have to keep going back to the tool dump to collect small tools.

A Halligan tool is very often used when dealing with the sheet metal work of buses, minibuses, heavy goods vehicles, trams, trains and aircraft and where it is necessary to make a large opening, use is made of the Halligan tool. This works like a large can opener and can be moved along the plate work and when used in combination with a hydraulic cutter is extremely efficient and quick.

*Other Hand tools include:*

1. Hack saws
2. Hammers
3. Axes
4. High lift jacks
5. Pot jacks

### Pneumatics

Apart from Lifting bags air driven tools can play a significant part in a rescue if the area is not safe to operate hydraulics in or if they are busy or not available these include:

- Air chisels
- Saws

The same safety procedures are adopted when using these tools, a disadvantage of this type of tool is noise coupled with a high air requirement.

### Battery operated tools

Reciprocating saws as well as hydraulic battery operated tools are already being used in the market. The reciprocating saws are easy to carry and very efficient cutting tools. Their main disadvantage is noise and danger to the vehicle occupants from the moving blade. As more vehicles on our roads are being made from polycarbonate materials, which shatter when cut with traditional cutters, I can see the use for reciprocating saws a frontline extrication tool becoming more frequent.

### Rescue assist tools

Apart from the traditional tools such as hydraulics and pneumatics there are a number of other assist tools that can help the rescue team secure the environment and ensure the safety of the team and casualty. Here are a few I have found very helpful during extrications:

1. Stabilisation material of all types effective stabilisation is the key to efficient rescue. Wood cribbing, plastic chocks and blocks and shores are a few items we use.
2. Tool staging tarpaulin for keeping equipment clean and in one place.
3. Centre punch for breaking windows
4. Glass cutters for laminated windshields
5. Protective covers for sharp metal with magnets to keep them secure
6. Plastic protective shield for the casualty
7. Clear plastic cover to protect the casualty from flying glass and metal
8. Valve stem puller to deflate tyres so they can be re-inflated for towing
9. Airbag restraint systems for the steering wheel
10. Knives and screwdrivers for cutting and stripping to locate airbag cylinders in the C pillar

There are many tools being developed to assist rescuers and as access into vehicles through laminated and polycarbonate constructions becomes more frequent and difficult, more tools will be developed.

In conclusion I would like to thank my friend and mentor the late ICET founder Rob Walmsley for assisting with some of the material for this article. Our view has always been there are many ways to removing parts of a vehicle, but before all, know your equipment and techniques, be safe and let common sense prevail.

Charlie McClung, Ndip AEC Natal, has been a rescue paramedic for 22 years, his skills were honed in the military and the Kwazulu Natal townships in South Africa as a National Diploma Paramedic before moving to Botswana where he was chief paramedic for an aviation rescue service. At present he runs a training school in Botswana and provides specialist rescue assistance the local emergency services. Part of his portfolio is a chief instructor for ICET in the Netherlands, providing specialist rescue training to rescue teams worldwide.



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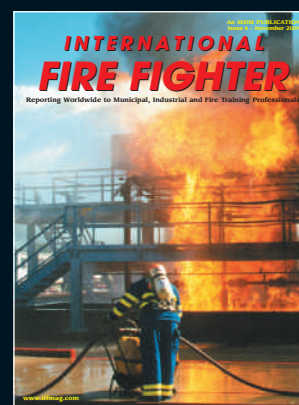
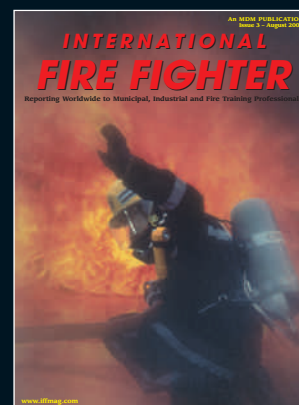
## MAY 2005 SPECIAL OFFER



From June 6th-11th 2005, the world's largest exhibition aimed at fire and rescue personnel worldwide takes place in Hannover, Germany. Interschutz is held once every 5 years and anyone who is involved with the fire and rescue industry should attend this very special event.

IFF will be exhibiting at Interschutz and will be handing copies of the May issue to visitors at the show. Advertising in this issue of IFF will give advertisers old and new a great opportunity to reach out and make their presence known as well as establish contact with people they might otherwise of not reached.

Between now and the 22nd of April, any company wishing to advertise in the May issue will receive a free 300 word product news release to be published in our special Interschutz product update section of the magazine as well as receiving a discount off our published advertising rates.



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# The Basic Uses of a Thermal Imager

By Jonathan Bastian,  
Bullard Thermal Imaging  
Training Manager

*Bst after thermal layer falls*

a focal plane array or FPA).

Another way to understand the difference between infrared energy and visible light is to compare the TI and the human eye. The FPA and the eye are both receivers. They receive energy (IR or visible light) and convert it into an image our brains can interpret. The FPA receives wavelengths of heat energy called “infrared” while the eye receives wavelengths of energy called “visible light.”

## FIRE!

Structure fires are the most common and most understood application for thermal imaging. A firefighter can use the TI during *incident size up*. While sizing up the building, Engine 5 evaluates the image from Photo 1. This

THERMAL IMAGING IS ONE of the newest technologies to enter the fire service. The rapid acceptance of thermal imagers by the fire service alludes to the importance of these new tools. The Federal Emergency Management Agency (a government agency in the USA) recently estimated that only one-fourth of all US fire departments have a thermal imager (TI). Anecdotal evidence indicates the ratio may be even lower internationally. This article is written for those who are relatively unfamiliar with thermal imaging, and briefly explains how the technology works, as well as how it can be used effectively at emergencies.

## THE TECHNOLOGY

Current fire service TIs use old military technology. This technology detects infrared energy and converts it into a visible image on a display. Modern militaries use infrared (IR) detectors to permit their forces to see and target opposing forces, regardless of the battlefield's light and smoke conditions. The properties that made IR detection valuable to the military also make it valuable to fire services.

IR is a portion of the electromagnetic spectrum, which ranges from gamma rays and x-rays, through visible light, past infrared and microwaves to radio waves. The energy's wavelength determines placement within the spectrum. As the wavelengths vary, so do the properties of the different types of energy. IR is a portion of the electromagnetic spectrum that humans normally perceive as heat.

Visible light has a relatively small wavelength. This wavelength is susceptible to interference from small airborne particles, such as the carbon in smoke or the water in fog. IR has a longer wavelength than visible light. The longer wavelength is not easily reflected by small particles; therefore IR essentially “weaves” through the particles to reach the detector (the IR receiver, also called

*IR is a portion of the electromagnetic spectrum, which ranges from gamma rays and x-rays, through visible light, past infrared and microwaves to radio waves.*



# The Basic Uses of a Thermal Imager

image clearly shows that high heat has taken the entire right portion of the building. Very high heat near the roof is evident as well, and because this type of building uses steel truss supports, the roof is a safety concern. Engine 5 now knows that the fire is well involved and already attacking the roof supports. If there are no victims inside, the firefighters can choose to operate more safely from the outside.

Firefighters can also use TIs during *fire attack*. By using a TI while advancing its line, a hose team can find it's the seat of the fire quickly and safely. Because the team can see walls and furniture with the TI, it can move quicker and safer through complicated buildings. In heavy smoke conditions, the TI might even help identify which room or apartment is actually on fire. Firefighters will locate stairs and ladders faster as well.

*Ventilation* is another aspect of the structure fire where TIs can assist firefighters in doing their jobs more effectively. With the TI on the roof, firefighters can look for the highest heat source to ensure they place any ventilation holes as close as possible. Perhaps more importantly, the TI may help identify compromised roofing before a company is committed to the roof. Holes or gaps hidden by smoke or darkness could be evident on the display.

The most common thermal imaging use is *search and rescue*. Several studies have shown that TIs improve search speeds by up to seventy-five percent and can more than double search success rates. For thermal imagers to be effective in search and rescue efforts

the TIs must arrive early in the incident and they must come off the apparatus with the firefighters.

Many departments successfully use their TIs in *overhaul*. By using the TI to identify hot spots, firefighters can focus their overhaul efforts and limit collateral damage. Focused efforts reduce firefighter fatigue as well as reduce on-scene time. For firefighters to gain the most use out of their TIs, they must know how to use them in areas that exhibit "thermal saturation," which occurs when everything in the viewed area is very warm (such as a room after the fire is extinguished). The TI will then display everything in varying shades of light gray and white because everything in the scene is warm or hot. In this situation, firefighters need to

properly use the other features of their TIs (such as thermal throttles, EI modes or pyrometers) to identify the hottest spots.

## SAFETY!

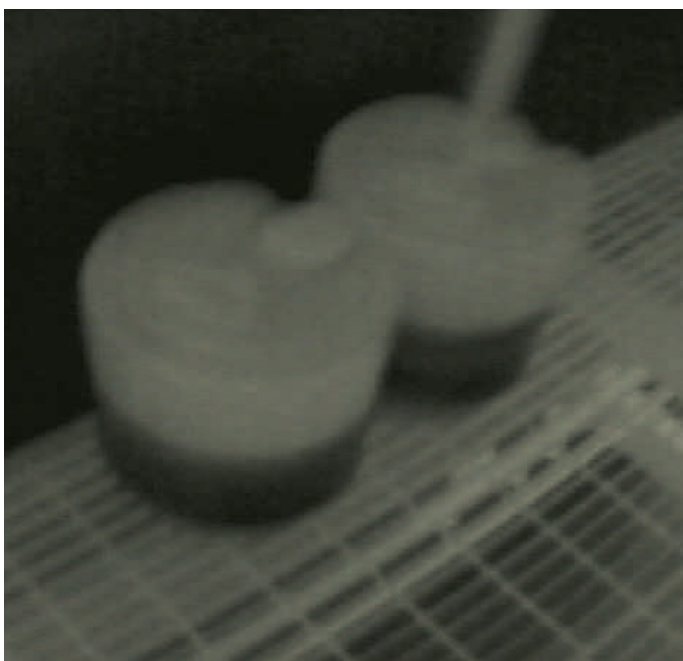
A key aspect of thermal imaging use is *firefighter safety*. A TI may confirm that a building has truss-roof construction or it may show damaged or missing trusses. Holes in floors and partial collapse, normally hidden by smoke or fire, may be visible to a firefighter with a TI. With proper training, firefighters can even identify the thermal layer and possibly recognize pre-flashover conditions. Different IR detectors will "see" the superheated gasses of the thermal layer differently, but firefighters can train to recognize them. Photos 2a and 2b demonstrate how TIs can show superheated gasses, as well as how quickly conditions can change even if firefighters are equipped and experienced with TIs.

These images also demonstrate how firefighters can get overconfident with TIs. By standing, these firefighters are violating a basic rule of firefighting. The intense heat from a diesel-fueled fire not only forces them to the floor, but it drives the firefighters from the area in less than one minute. Firefighters must always remember that TIs do not eliminate the need to follow basic firefighting safety practices.



*Best before thermal layer falls*





T3 5 gallon pails half full

### CREATIVITY!

Many fires are outdoors, and many fire departments have successfully used TIs for *wildland (bush) firefighting*. The TI can help officers' track personnel and vehicles, guiding them through smoke or helping them avoid unseen hazards. Used in a helicopter, a TI can help determine the exact fire line and monitor any hot spots. Because IR does not penetrate glass, firefighters using a handheld TI from a vehicle or aircraft must operate it safely through an opening.

Thermal imagers have also assisted during *hazardous materials incidents*. The imager can help track product leaks, identify leaking containers and even determine product levels in sealed containers. Any hazardous material situation that involves temperature changes and product separation can be an excellent opportunity to use a TI. Firefighters should be cautious in explosive environments, however, since there is no thermal imager that is intrinsically safe. Photo 3 demonstrates how a TI can indicate product levels under the correct conditions.

Thermal imagers can also assist with *emergency medical incidents*. One easy application is looking for amputated fingers. Fingers amputated in a factory should have a different temperature than the factory floor, and therefore should be visible on the TI. At motor vehicle accidents, the TI can help find passengers who were thrown from the vehicle by the collision. Creative firefighters have even used thermal imagers to look for heat signatures in car seats to see if they were recently occupied. Just as the technology can help departments locate patients at an accident, it can also help them find a lost child in a forest or an elderly person who wandered away from a nursing home.

*Training* is another use for thermal imaging. TIs help firefighters monitor interior conditions and participant safety during live-fire evolutions. Safety officers can identify firefighters at risk of high-heat exposure before their turnout gear is damaged or before they are injured by heat or steam. Since most

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*Tl Comm type 3 fire*

TIs are available with a wireless transmitter, training officers can connect the receiver to a television and video recorder and remotely monitor and record the thermal images. They can review the recording later for additional learning opportunities.

#### CONCLUSION

Thermal imagers restore the ability to see in thick smoke or at night, with capabilities limited only by the creativity

of the firefighter. TIs regularly demonstrate their value as critical firefighting tools for fire departments around the world. When properly used, TIs offer tremendous advantages to firefighters at a variety of emergencies, including fires, searches for victims and outside operations. Once firefighters understand the value of thermal imaging, they can request these essential tools. TIs can make the firefighter's job easier, safer and faster.

Jonathan Bastian is the Thermal Imaging Training Manager at Bullard. He leads the training team, whose primary focus is to educate the fire service on the safe and proper use of thermal imagers. Bastian is certified as a thermal imaging instructor by the Law Enforcement Thermographers' Association (LETA), the international public safety organization specializing in thermal imager certification and training. He is also a member of the NFPA Technical Committee on Fire Service Training.

Educated at Brown University and licensed as a high school teacher in Illinois, Bastian served 12 years on the North Park Fire Department (IL), including the last three as a captain. As Health and Safety Officer, he led the development and implementation of the Department's Rapid Intervention Team SOG. Bastian is a certified Fire Instructor I and Firefighter III, and he spent 12 years as an EMT-I/D. He has taught classes on thermal imaging, rapid intervention teams and search and rescue operations.

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## FUNCTIONAL AND FLAME RESISTANT PROTECTIVE CLOTHING MADE OF LENZING FR® BLENDS



© by Hermann Kollinger OÖLFV

Today's relief forces must be flexible and adaptable; able to tackle fire fighting, electrical-, chemical-, or biological- incidents as well, as all kinds of civic or natural disasters. Therefore their Personal Protective Clothing hereafter referred to as PPC must be as flexible and functional as our fire fighters.

We know, that various devices and machinery are applied for human saving and disaster-management actions. However, in our hi-tech world we tend to forget that all this machinery is worthless without the strength and efforts of the men and women using them. These devices are simply the tools used to accomplish a better job and improve efficiency.

PPC should not only be protective – it should be functional as well

All physical activities require strength and movement. This movement, especially for a fire fighter in the line of duty, produces heat and heat, coming from the body, naturally produces moisture and perspiration. To keep the body at an optimal temperature, allowing for optimal performance, PPC must lift moisture away from the skin.

### The Process

*PPC lifts and absorbs wetness, transporting moisture away from the skin and support the evaporation of perspiration.*

Research has proven, that using functional PPC increases the efficiency and effectiveness of the wearer. Having a dry and comfortable feeling on ones skin enhances ones performance in any type of situation. Clothing which does not take these factors into consideration can lead to fatigue or mental distraction of the wearer increasing the probability of occupational

injuries – not forget to mention the possibility of heat stroke resulting from heat stress. Not taking these factors into consideration can create a hazardous situation for both- the individual and their team.

Statistics show that the most common occupational hazard for fire fighters is internal trauma at 49%, followed by asphyxiation 25%, 17% from miscellaneous injuries and 9% from burns proving the indisputable necessity for proper protective clothing which enhances the body's natural regulatory systems. The appropriate clothing plays an important and often underestimated role in the prevention of accidents.

### Using and understanding the fibres and their properties

Any PPC coming into contact with fire or heat must be flame resistant, but it must also be comfortable and able to absorb and transport the moisture. Achieving the required effects requires the uptake and lift of moisture. Therefore, functional clothing consists of two fibre components, one which absorbs and hold wetness away from the skin and one, which remains dry, creating a feeling of comfort to the wearer.

Many High Performance Fibres existing on the market (Meta Aramides, Para Aramides, Polyimide, Poly Amidimid, etc.) which are used for this application. These fibres have been proven to be excellent in respect to their flame resistance performance but their lack of moisture removing capability limits their functionality. There is another fact, which should taken into consideration when purchasing PPC. Some of the High Performance Fibers (Carbon-, Aramide- Fibers,) lead the heat too fast through the garment onto the skin.

Especially for Hoods or garments which are worn directly on the skin functionality and insulation is a very important issue.

For this reasons protective apparel is used in different blends for example 50/50 or: 65% Lenzing FR® (inherent flame resistant Cellulosic fiber) and 35% Aramid (Kermel®, Conex®, oder Nomex®).

Properties of this blends with Lenzing FR® and Aramides are:

1. Same flame resistance like 100% Aramide fabrics.
2. Better insulation against different types of heat.
3. Unmatched wearer comfort
4. Durability.
5. Remarkable Price/Value performance.

### Lenzing FR®, High Performance – Made in Austria

Many endusers know the different Aramide fibers like Nomex®, Conex®, Kermel® very well. Lenzing FR® is mostly the "silent" blending partner, but exactly this fiber makes the fabrics so special and contributes a big portion on the popularity and performance of this garments.

Fabrics made of Lenzing FR® are used for protective clothing in the Metal Industry (resist for example impacts of 1600°C hot, liquid Steel, Aluminium), Military (Air Force Pilots, Tank drivers, Marines), Police and Special Forces.

Products including Lenzing FR® for Fire Fighting applications cover: Station Ware, Protective Hoods, Underwear, Polos, Pullovers, Internal lining in Fire Fighting jackets, cuffs and lining in gloves. . .

### Conclusion

Fabrics respectively garments made of Lenzing FR® blends offer the wearer better comfort, increased protection against heat at the highest levels of flame resistance and fire protection. The different properties of the fibers used in the garments maximise the performance of the wearer and minimising at the same time the risk of heat stress and heat stroke.

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Alexander Gstettner

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*Pic courtesy of Bristol Uniforms*

# Firefighter PPE Specification

**By Ivan Rich,  
Technical Manager,  
Bristol Uniforms Ltd**

WITH AN EVER-INCREASING range of hazards to which firefighters can be exposed, the correct specification of protective equipment is essential to ensure their consistent and comprehensive safety and security. A full understanding and appreciation of the varied conditions which the firefighter may face in the diverse operational environments to which the emergency services are required to respond is essential if their personal safety is not to be compromised.

Extensive guidelines are now available to any employer engaging the services of professional firefighters to help them understand the hazards to which firefighters may be exposed, assess the risks involved and select the protective clothing essential to ensuring the operational safety of their employees – safety which is clearly designated *their* responsibility. This now means that the selection of PPE not only involves fitness for purpose but its lifetime performance to measurable standards of protection.

PD CEN/TR 14560:2003 is the definitive document which sets out guidelines for the “selection, use, care and maintenance of protective clothing against heat and flame” and was published in June 2003.

This Standard sets out to look at all aspects of PPE which are now essential areas of responsibility for specifiers and buyers of personal protective equipment, in particular clothing, and to provide a summary of the key issues

to be considered.

In broad terms, deployment of firefighters in both public sector and private industrial environments places a responsibility on employers to carry out a thorough assessment of the operational conditions under which those firefighters can, and will, be expected to work. This includes. . .

- A comprehensive risk assessment
- A detailed definition of the level of protection required
- Familiarisation of the alternative types of protective clothing available
- Undertaking wearer trials
- Obtaining any further supporting test data which would assist decision making

Buyer decision-making must now go beyond this stage into an understanding and appreciation of the conditions under which the PPE will be used and will require the buyer to consider additional points including:

- User training in the conditions under which the garments can be safely used and limitations on their performance
- Appropriate record keeping to provide adequate management information
- The importance of routine PPE examination and inspection
- The evaluation and monitoring of protective clothing performance in service

A third, and critically important, area of responsibility concerns the ongoing care and maintenance of all PPE. It is the responsibility of the manufacturer to ensure that comprehensive care instructions are provided with all garments to allow the employer to put in place a care and maintenance programme, which ensures the continued performance of all PPE to the required standards. This will include the need for appropriate measures for. . .

- Cleaning
- Decontamination
- Storage

. . . as well as maintenance which will include . . .

- Inspection and inspection criteria
- Repairs
- Removal of garments from service and the criteria for such decisions
- Safe disposal



# PPE Buyers/ Users Guide

The responsibilities now placed on employers are such that it is incumbent on them not only to fully understand and appreciate the extent of these responsibilities but also how to discharge them effectively. To assist in this process it is important to look at each of the areas in more detail.

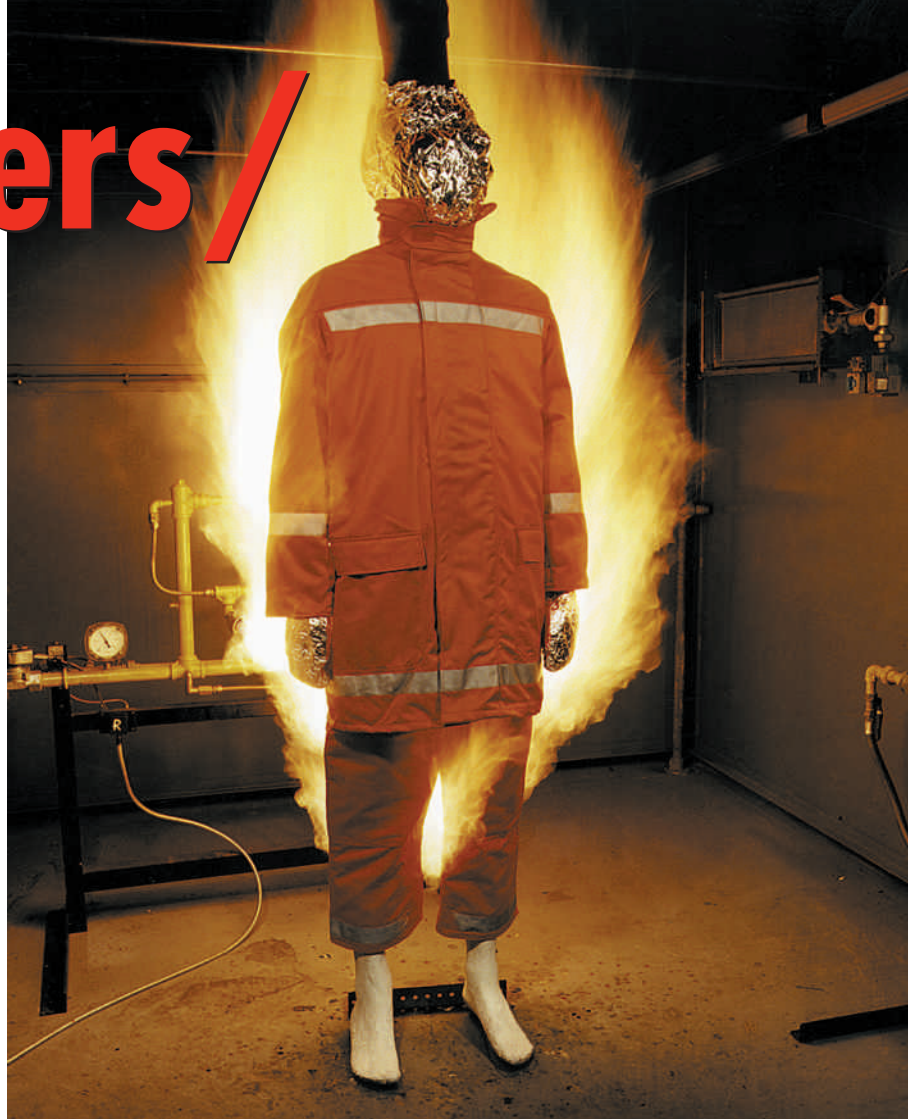
## SELECTION

Selection is a process, which seeks to match the performance of the garment to the hazards to which it will be exposed requiring a thorough risk assessment. This will include. . .

- An identification of the wearer's activities
- An understanding of the complete range of potential hazards likely to be encountered
- Risk quantification
- An assessment of the level of protection required from the PPE taking into account other extraneous conditions likely to be present in firefighting conditions

To match protective garments to the wearer it is important to appreciate the need for garments to be fully compatible and that each provides the required level of body protection under any operational conditions. To this end buyers should ensure that any potential supplier can provide a comprehensive sizing service as well as wearer trials to ensure compatibility, comfort and good fit. The style and cut of fire coats and trousers will need to be considered carefully in conjunction with their use alongside helmets, hoods, boots and gloves.

Once the available options have been considered, the selection process to



Pic courtesy of Bristol Uniforms

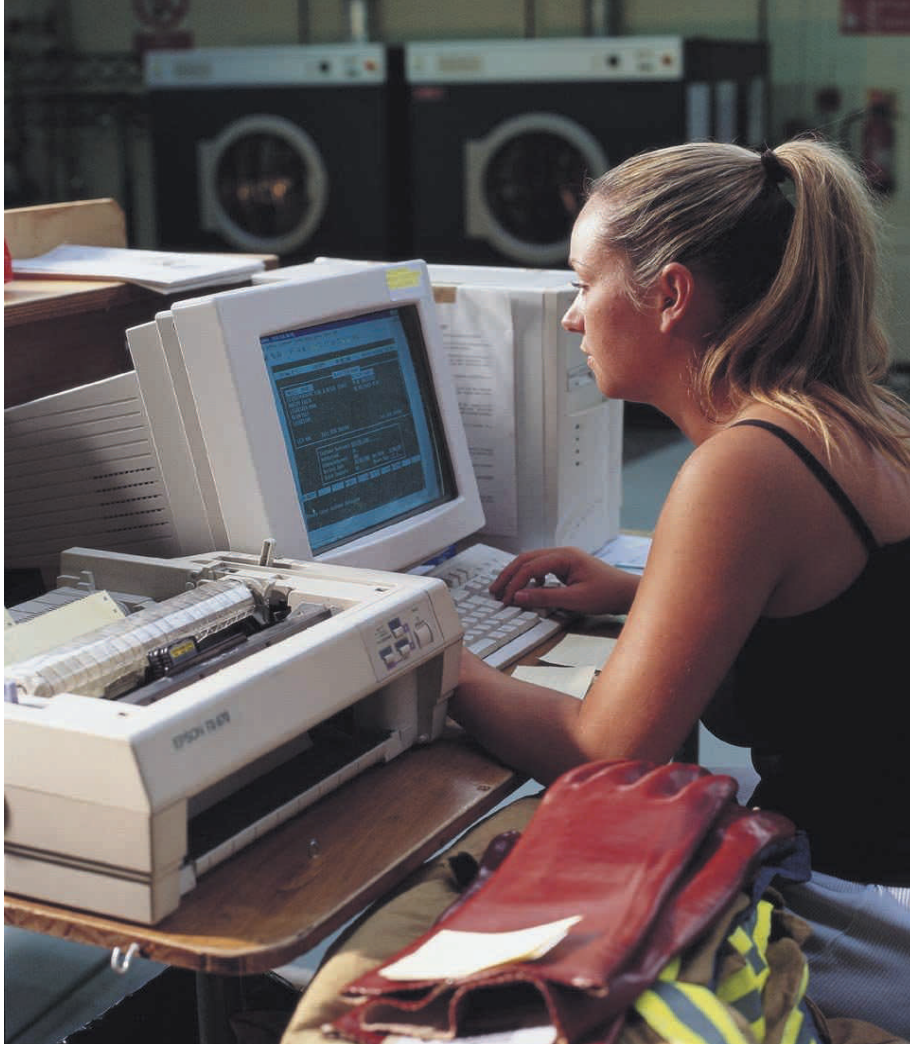
determine which manufacturer's PPE is best suited to the identified needs of the user should then consider. . .

- Are the garments manufactured under carefully controlled conditions (does the manufacturer have internationally recognised quality assurance accreditation e.g. the appropriate ISO certification?)

- Do the garments meet the necessary performance standards as set out in the appropriate PPE directives and are they independently certified as such? (Directive 89/686/EEC)
- Does the manufacturer use component materials (outer layer, moisture barrier and thermal protection) in clothing, which are independently assessed and certified in their own right?

*To match protective garments to the wearer it is important to appreciate the need for garments to be fully compatible and that each provides the required level of body protection under any operational conditions.*





Pic courtesy of Bristol Uniforms

- Does the manufacturer submit garments for type testing in simulated fire tests or other recognised independent laboratory assessment programmes to evaluate performance after washing, decontamination or UV exposure as well as abrasion resistance and chemical repellency?

Given the close co-operation required between supplier and buyer to arrive at well drawn up specifications, other considerations, which will be important in ensuring a satisfactory long-term relationship will include. . .

- The provision of appropriate user/wearer training (will this be undertaken directly by the manufacturer or will it be contracted out to a third party and how will this be effectively monitored and quality controlled?)
- The provision of a comprehensive after sales service and long term maintenance plan (this is discussed in greater detail under *Lifetime Care*)

- An agreement on a mutually satisfactory garment delivery time from order for both standard and special sizes
- Stockholding arrangements for emergency or unexpected short-term demands (whose responsibility will this be or is it a shared one and how will this be organised to ensure that availability is not compromised?)

*Before garments are put into active service the first requirement will be to set up and implement a training programme to satisfy European Directive 89/656/EEC (section 11, article 4 para 8).*

## PPE IN USE

Once PPE comes into operational use, the emphasis shifts to the employer who must adopt procedures which ensure that all garments for which they now have responsibility are worn and looked after correctly.

Before garments are put into active service the first requirement will be to set up and implement a training programme to satisfy European Directive 89/656/EEC (section 11, article 4 para 8). It is important at this stage for supplier and user to understand and appraise the wearer of the capabilities as well as the limitations of the garments being brought into use. In particular this will include training on;

- What hazards will be protected against and which won't
- The effects of long-term exposure on the garments
- The proper use of the PPE
- Complying with supplier's instructions on use, storage, cleaning, conditions of exposure, which might render the garment unwearable, repair, replacement, and eventual removal from use and disposal.

In service, all garments need to be monitored regularly to ensure that they continue to meet performance criteria. This will necessitate the use of effective records to allow comprehensive management information systems to be adopted. Record keeping should enable a full life history of each item of PPE from manufacture to disposal. Records should be detailed enough to include for each individual item:





LENZING FR®

# Lenzing FR®

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The following Case- Histories highlight only a small part of the wide application field of Lenzing FR®- Those people rely and count to hundred percent on their protective clothing!

## Fire Brigades: Fire Fighting and Disaster Management!

Stationwear  
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Protective Hoods  
Underwear, cuffs  
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## Police: Training of the Anti-Riot Police in Kent/UK!

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Naval Forces  
Tank Pilots  
Special Forces



## Industry: Aluminium Smelters!

In October 2002, a terrifying accident shocked all the workers at a particular smelting plant. In the subsequent investigation, it was calculated, that the operator involved in this mishap had supported more than 30 kg of molten aluminium, without sustaining any damage, as a result of wearing garments made from Lenzing FR®.



Contact:

Lenzing AG, 4860 Lenzing, Austria, Tel.: +43/7672/701-3290, Fax: +43/7672/918-3290, E-mail: [lenzing-fr@lenzing.com](mailto:lenzing-fr@lenzing.com)





*Pic courtesy of Bristol Uniforms*

- A manufacturer's specification
- A service history
- Training records
- Cleaning history
- Maintenance and repair history

Wearers should be trained to undertake their own regular kit inspections to check for soiling, contamination, physical and thermal damage and to inspect for any missing accessories such as reflective trim, which might compromise safety.

#### LIFETIME CARE

An integral part of the European Directive 89/686/EEC is a requirement that the manufacturer supply full care and maintenance instructions. These must be clearly stated on permanent labels affixed to each garment and should also be available in the form of a users guide or handbook for reference purposes.

It is the buyer's/owner's responsibility to ensure that a suitable programme of garment care is put in place. This can be an in-house capability or can be delegated to a qualified third party or the manufacturer. Given the specialised knowledge and equipment required to undertake the comprehensive care and maintenance schedule to the required standards, it is becoming increasingly common for fire services to buy in the expertise rather than divert scarce resources to handling it themselves.

Manufacturers are in many respects best equipped to handle the care of PPE as they have an intimate technical

understanding of the materials and fabrics involved and the expertise to inspect for damage and test for performance reductions brought about by exposure to fire and water and physical damage. In particular, requirements include the ability to determine. . .

- What cleaning methods are appropriate, including decontamination?
- When should garments be cleaned?
- Is it appropriate for inspection and care to be carried out to a pre-planned a scheduled or on ad hoc basis?
- Who will carry this out and how will any re-application of finishes or fabric treatments be undertaken, if required?
- How and where will garments not in use be stored?
- Good and appropriate cleaning practice

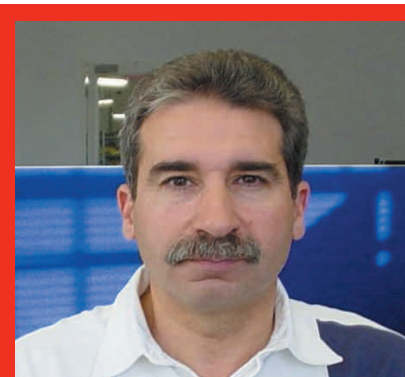
Special attention needs to be paid to decontamination to ensure that this is undertaken effectively and safely and to ensure that cross-contamination does not occur.

When deciding whether or not to contract the lifetime care and maintenance to the manufacturer there are a number of issues to be considered including. . .

- The level of service offered and its reliability
- The degree of flexibility provided (collection and delivery of garments, any on-site facilities where required etc)

- Are the services provided directly by the manufacturer or are they hired in from a third party and how might this affect quality control and service delivery?
- The opportunity cost of contracting out
- Overall value for money

Given the important health and safety implications for the wearer and the strict codes of accountability placed on the employer it is evident that the selection and use of PPE in the fire service has far wider implications than ever before. With ever-greater emphasis now being placed on the health and safety of the wearer, employers and leading manufacturers are now actively looking into the design and development of garments, which also take into account the effects of heat stress from prolonged use of PPE. Attention, and the prescribed standards, have hitherto focused on the impact of, and need for protection from, external hazards. It is now increasingly recognised that the wearers own body heat and fluid emissions can be significant health and safety factors under operational conditions. Selection of PPE in the future will increasingly focus on identifying garment constructions, which not only meet the required external protection requirements but also minimise the potential for fatigue and heat stress problems.



Ivan joined Bristol Uniforms in 1981 and as Technical Manager for the Company is responsible for ensuring relevant accreditation to the European standard EN 469 for Bristol Uniforms' products and to NFPA 1971 (2000) edition. He has an extensive knowledge of Standards and technical requirements relating to fabrics.



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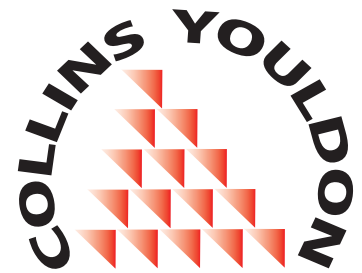
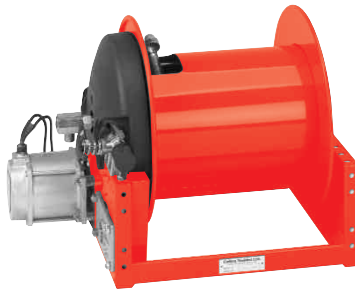
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# Big Hose Means Big Water

By David Durstine,  
Akron Brass Co.



Pic courtesy of Akron Brass

IN 1991, THE OAKLAND HILLS FIRE in California destroyed over 3,000 homes and took two dozen lives. At the height of the fire, reservoirs feeding hydrants in the area were depleted after flames knocked out power to the resupply pumps. House by house and block by block, firefighters began to run out of water. In one neighborhood, pumper crews were getting ready to pull back when they got an urgent radio call – “Hey, hang on. We’re coming!” The call came from San Francisco firefighters responding with their special-purpose hose-layer. They had located a hydrant that was still working and proceeded to lay 550 meters (1,800 feet) of 130-millimeter (5-inch) hose up the hill to the fire. With a pumper boosting pressure from the hydrant, they were able to supply nearly 7,600 lpm (2,000 gpm) and help save ninety homes.

It wasn’t the first time that the San Francisco Fire Department used their hose-layer to bring water to an area where none existed. After the 1989 Loma Prieta Earthquake collapsed several older apartment buildings and started a major fire in the residential Marina District of the city, the department used large diameter hose to bridge blocks of broken water mains and bring water from a fireboat anchored in the San Francisco Bay.

Today, more than fifteen years later, fire departments and brigades around the world are utilizing large diameter hose to fight a wide variety of fires ranging from urban to wildland.

## MORE WATER AND GREATER DISTANCE

The reason for the shift to large diameter hose (LDH) is simply a matter of geometry and hydraulics. If you double

the diameter of a hose, you increase its area by four. And four times the area with twice the diameter means you can deliver approximately four times the flowrate with half the pressure drop – or four times the flowrate over twice the distance with about the same pressure drop.

For example, most American fire departments have used 65-millimeter (2.5-inch) hose as their standard pump supply line for almost a hundred years. The trusty “two-and-a-half” can deliver 950 lpm (250 gpm) over a distance of about 150 meters (500 feet) when connected directly to a hydrant. For higher flowrates, departments have to lay multiple hoselines or have a second

*The trusty “two-and-a-half” can deliver 950 lpm (250 gpm) over a distance of about 150 meters (500 feet) when connected directly to a hydrant.*



# Big Hose Means Big Water

pumper boost the pressure from the hydrant. By switching to 130-millimeter (5-inch) hose, however, they can potentially flow 3,800 lpm (1,000 gpm) over a distance of 300 meters (1,000 feet) from the same hydrant using a single hoseline without needing a second pumper.

Those kind of numbers made many fire departments realize that it didn't take a major disaster like the fire in Oakland or the earthquake in San Francisco to make large diameter hose worthwhile. The one-two punch of being able to deliver more water over greater distances solved a lot of water supply problems for urban and rural departments alike, who began replacing their old hose with newer, larger hose.

The movement to adopt larger supply hoses was accelerated when the Insurance Services Office (ISO), which rates most of the fire departments in the United States, recognized the capabilities of LDH and gave credit for higher water supply flowrates if the department used the big hose. In some cases, the additional credit could boost the department's ISO rating sufficiently to reduce fire insurance premiums for property owners throughout the area. Smart departments often used that argument to persuade taxpayers and town councils to budget the funds necessary to buy the big hose.

## ALL TYPES AND SIZES

As LDH became popular, customers began to request changes in order to meet specific needs. Low-pressure supply hoses were quickly supplemented with new high-pressure discharge hoses suitable for delivering water to aerial monitors and building standpipe systems. Cumbersome threaded fittings

were augmented with quick-connect Storz couplings, and the heavy, double-jacket cotton construction on early hoses was largely replaced with light, through-the-weave synthetic construction. The result has been the development of a wide range of LDH types and sizes.

In the United States, any hose with a diameter greater than 65 millimeter (2.5 inches) is considered to be a large diameter hose. The most common sizes are 100-millimeter (4-inch) and 130-millimeter (5-inch).

The 100-millimeter (4-inch) hose can flow about 1,900 lpm (500 gpm) over a distance of 300 meters (1,000 feet) when connected directly to a hydrant. With a pumper at the hydrant, it can carry 2,850 lpm (750 gpm) or more over the same distance. This size has the advantages of costing less, weighing less, and taking less volume than larger hose. It is often used by departments who need to move a moderate

amount of water over a limited distance.

The 130-millimeter (5-inch) hose can carry much higher flowrates over much greater distances for only a small increase in cost, weight, and volume. It is the most popular size LDH in the United States, and most pumpers carry 250 meters to 300 meters (800 feet to 1,000 feet) as their standard supply hose. Special hose-layers, such as the ones used in San Francisco, may carry up to 1,500 meters (5,000 feet).

Even larger hose is available for large-scale municipal water supply and industrial firefighting operations. Hoses with diameters of 150 millimeters to 300 millimeters (6 inches to 12 inches) are now available and can move enormous volumes of water. The 150-millimeter (6-inch) hose is used by a few departments who need very high flowrates, but the 200-millimeter (8-inch) and larger hoses are difficult to handle and have not found much use with fire departments yet.

For each LDH, there are different pressure ratings depending on the manufacturer and the intended use. The service test pressure ratings for 130-millimeter (5-inch) supply hose average about 13.8 bar (200 psi). This is the pressure that departments use when they conduct their annual hose tests. The actual working pressure in regular service is usually slightly less. If departments need to operate at higher pressures – for example, to pump water to the upper floors of a high-rise



*Pic courtesy of Akron Brass*

building, or to achieve high flowrates for a long distance without using a relay pumper – they can specify attack hose with service test pressure ratings up to 20.7 bar (300 psi).

Each LDH also has different pressure drops depending on the hose construction. For example, the diameter of some hose increases under pressure to allow higher flow. For a typical 130-millimeter (5-inch) hose, these figures can vary from about 0.23 bar (3.4 psi) to 0.45 bar (6.6 psi) per 30 meters (100 feet) of hose when flowing 3,800 lpm (1,000 gpm). Although these differences result in only minor variations in pressure when the length of the hose lay is short, they can be significant for long hoselays. Departments need to ask manufacturers for actual flow test data when selecting a hose.

#### THE SECRET IS IN THE CONNECTIONS

The secret to moving large volumes of water from one point to another is not only in the hose, but also in the connections used at each end. With the proper connections, LDH water supply operations can be fast, safe, and efficient.

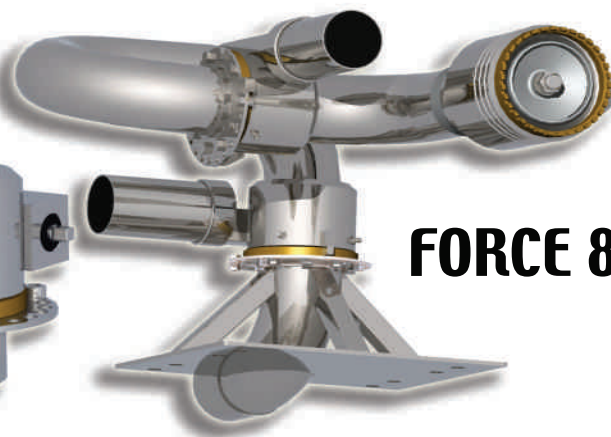
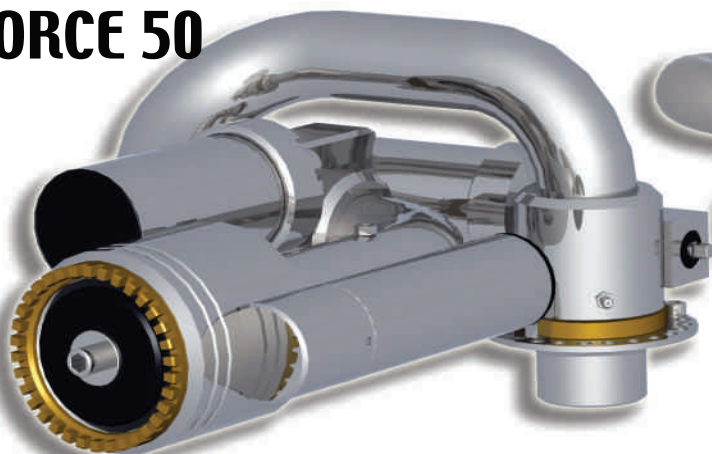


*Pic courtesy of Akron Brass*

One of the most important connections is the intake valve on the pumper located on the downstream side of the large diameter hoselay. With thousands of pounds of water rushing through the intake hose, any sudden valve closure at the pumper would cause a massive water hammer that could burst the hose and injure the pump operator.

To avoid this serious problem, the intake valve for LDH has a handwheel-actuated shutoff that is designed to close slowly. To protect hoses on the discharge side of the pump from excessive pressure during pumping operations, the intake valve also has an adjustable pressure relief device to dump water onto the ground if the intake pressure

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# Big Hose Means Big Water

exceeds a certain value. And finally, the intake valve usually has an air bleeder valve to remove trapped air from the intake hose while it is filling during the start-up of operation.

Hydrant adapters are another important connection. To connect the Storz fittings on the large diameter hose to the threaded fittings found on older hydrants, most fire departments carry an adapter that can be quickly spun onto the hydrant threads. If the department wants to use more than one hydrant outlet in order to maximize the flowrate, they can attach several short lengths of hose to the hydrant and join them into a single LDH supply line with a siamese connection.

On the discharge end of the LDH hoselay, various configurations of gated wyes can distribute the main flow from the large diameter hose into several threaded hose connections, each with its own shutoff valve. This lets firefighters route hoselines to different appliances, or attach multiple handlines to the LDH to attack the fire from different locations.

And finally, portable monitors with Storz inlets can be attached directly to the end of an LDH line to take advantage of the full flow capacity of both the monitor and the hoseline. Flowrates up to 3,800 lpm (1,000 gpm) are possible from a single portable monitor to protect exposures or deliver a fire-killing attack with a minimum of personnel.

## DOZENS OF USES

The development of different large diameter hose types, sizes, and connecting devices gives fire departments and brigades the flexibility to apply the

new water-moving technology to dozens of uses.

In cities and areas with closely spaced hydrants, fire departments can use LDH to take advantage of the full flow capacity of individual hydrants. Departments can also use LDH to bring large volumes of water from other hydrants throughout the area to maximize the water supply for fires in commercial structures. Some departments develop pre-plans for key buildings so that each arriving pumper knows which hydrant to use, how much hose to lay, and where to position the appliance to fight a major fire.

In smaller towns and villages with widely spaced hydrants, departments can use LDH to move good volumes of water over longer distances. This is especially important in the United States because ISO bases the water supply rating for each structure within 300 meters (1,000 feet) of a hydrant on the amount of water the department

can move from the hydrant to the fire. The larger the supply hose, the higher the water supply rating. Often a single LDH can supply as much water as four smaller hoses and can be put into operation in less time with fewer people.

In rural areas or towns where there are no hydrants, fire departments have to transport water from any available source in the area – ponds, rivers, reservoirs, or even swimming pools. Some departments opt to use two or more tanker trucks to shuttle water from a nearby water source to the fire scene. This operation is often cumbersome and requires a lot of vehicles and even more personnel in order to sustain a moderate flowrate. Other departments have found that long hoselays of LDH are more efficient and can achieve higher flowrates with fewer personnel. For example, with a pumper at the water source, a department can move 3,800 lpm (1,000 gpm) over a distance of 750 meters (2,500 feet) by using 130-millimeter (5-inch) hose. If they add a relay pumper in the middle of the hoselay to boost the pressure, departments can move the same flowrate twice as far.

Industrial plants are ideal candidates for LDH, especially if the plants are involved in oil refining, chemical processing, or other operations where there is a potential for large fires that would require large volumes of water. Industrial fire brigades often have high-capacity pumpers supported by hose-layers carrying large diameter hose to let them



*Pic courtesy of Akron Brass*

fight fires anywhere within the facility. Very large 250-millimeter and 300-millimeter (10-inch and 12-inch) hose is sometimes used in conjunction with large trailer-mounted pumps to generate the required flowrates.

The aftermath of a variety of natural disasters also present situations where LDH can be put to good use. Earthquakes, floods, and landslides can break water mains buried beneath roads or carried across bridges, leaving large populated areas without water for firefighting. Large diameter hose can act as an above-ground water main to temporarily bring water into the affected areas. Fires, hurricanes, and ice storms can knock out electrical power to pumping stations, rendering hydrants useless. Again, large diameter hose can carry water from fire department pumpers into the affected areas as needed.

One of the latest applications for LDH is wildland firefighting, where wind-driven firestorms threaten hundreds of homes and vast areas of trees and brush. Large diameter hose can be used to quickly fill helicopter supply



*Pic courtesy of Akron Brass*

tanks with water or retardant while keeping the ground crews safely away from the downwash of the helicopter blades. In other situations, large hose can carry water from a supply pumper positioned at a remote water source to a more accessible area where tanker vehicles have room to maneuver and be refilled. For a direct attack, short lengths of large hose can be attached directly to available hydrants in built-up areas and distributed to handlines

through gated wyes. This method does not require a pumper to boost the water pressure and allows firefighters to make multiple attacks with a minimum of appliances in order to protect structures along a wide fire front.

Other uses for large diameter hose include shipboard firefighting, auxiliary water supply for ARFF operations, and stand-by water supply for buildings under construction.

### How can LDH help you?

Large diameter hose has proven itself in a wide variety of situations over the past fifteen years. Departments and brigades that have not adopted LDH need only to ask themselves if there are places or situations where they need to move more water over greater distances with fewer personnel and lower cost. If there are, then LDH may be the solution. Remember that double the hose diameter means roughly four times the flowrate over twice the distance – big hose means big water.

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# AIRE GROUP

## A Fire Engine on a motorbike ...

A world-renowned emergency rescue equipment specialist has unveiled two more innovative products – a fire engine on a motorbike and a super-safe steel cutter.

The Aire Group scooped the prestigious Queen's Award For Enterprise for its inflatable Airoshower mobile decontamination unit and was recently awarded the tender to supply support systems designed to prop up collapsed buildings across the UK.

Now its compact Firexpress system and Petrogen Cutter are sure to amaze the emergency services too.

The Firexpress is a firefighting system that packs into the back of a car – or even on a motorbike – yet can be used to douse blazes including car fires, rubbish fires, grass fires, complex fuel fires and even house fires.

Aire Group Chief Executive, Richard Bailey, said: "It's a flexible system that works well both in busy cities or out in isolated rural areas."

"The motorbike can get through crowded streets far quicker than a large fire engine, while in the countryside the larger system easily fits into the back of a car or on a quad bike."

Firexpress uses a small amount of

water which it then transforms into a fire-drenching water fog or mist. This means only 12 litres of water is needed to tackle a car fire, around 10 litres to put out an inferno in a small room and far less than that to suppress and control small rubbish, grass or skip fires.

Water fog and mist controls and drenches fire by reducing the oxygen around the flames almost immediately. The tiny water droplets turn to steam very quickly which means each droplet expands an amazing 1,700 times to replace or dramatically reduce the oxygen in the fire area.

If there is no oxygen, there is no fire.

The Firexpress system operates at low



pressure at just 20/35 bar and does not spread the burning debris, but still manages to achieve a high density water fog up to 15 metres. The angled nozzle can be adjusted to give a straight stream of water or – at the click of a switch – a low expansion foam which can put out fuel fires raging over 1,000m<sup>2</sup>.

The Petrogen Cutter is a revolutionary way to cut through steel up to 14 inches thick.

It's far more powerful, safer and lightweight than acetylene systems . . . and a lot more portable. It runs on regular unleaded fuel and a special design means fuel line flashback is impossible, making it the safest cutting torch around.

The fuel remains liquid from the tank to the tip, there are no vapours to catch fire and a fast flow check valve shuts off the fuel if the hose is severed. The Petrogen tank will not become a bomb even if it is dropped, knocked over or catches fire, unlike acetylene and propane tanks.

Fully-filled petrogen fuel tanks are designed to go on the operator's back and weigh just 30lbs when full, yet will cut the same amount of steel as an acetylene tank weighing 200lbs.

In the UK, strut systems provided by Yorkshire-based Aire Group are part of the British Government's multi-million pound investment to provide its fire services with the latest urban search and rescue equipment.

Mr Bailey said: "Structural collapse emergencies happen somewhere in the world every day. Now with the terrorist threat so real, we have seen recent terrible examples of the havoc bombers can wreak on buildings along with the terrifying power of nature with the Indian Ocean tsunami."

"The Paratech support struts are designed to deal with the aftermath of these kind of catastrophes and would also be used after gas explosions, road accidents where vehicles have crashed into buildings and trench rescues."

In recent years the company's product range has expanded so much it now has six distinct categories – Airosheltas, Airemedical, Airorescue, Aire Urban Rescue, Airemortuary, Airtactical and Aire Planning.

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# Shipboard Firefighting

By Dave Cochran

*Pic courtesy of Dave Cochran*

THIS ARTICLE WILL DEAL only with firefighting efforts by firefighters other than those who are crew members of vessels. It is assumed the shipboard fire system is either inadequate, failed, or the fire became too involved for the crew to handle.

Combating marine vessel fires is a challenging task that will include not only those involved with the actual combat, but others as well. Obviously it will depend upon where the emergency takes place, as to which entities may become involved.

Fire fighters will be charged not only with the extinguishment efforts, but environmental issues as well. This is especially true with those vessels carrying petroleum products, but those that carry hazardous materials such as the materials involved with the petrochemical industry, and many other materials necessary for manufacturing of goods done in countries around the world.

While it is true, and based upon the cargo, the size of the vessel, and the amount of involvement to the vessel, will say a lot about the amount of water to be used, the amount of fire fighting foam that might be required, if any, the number and size of support vessels needed to support the efforts to save the vessel, the cargo, and equally

as important, the damage to the environment. To those persons who are not aware of the risks that are taken, it will seem to be a very simple task to make successful extinguishments and

eliminate the risks to the environment. When these vessels are tied up to docks in busy seaports, oftentimes the risks are far more hazardous and create more risk to those surrounding facilities and many times local residents who are subjected to smoke, fumes, and in some cases the danger of catastrophic explosions. On the high seas the risk is more to those involved in the combat



*Pic courtesy of Dave Cochran*





# Shipboard Firefighting

including the many support vessels involved.

The technology has changed dramatically in the past several years which allow fire fighting vessels to remain at safer distances on the seas. In ports, however, and obviously depending on the nearness of other vessels and structures, the fire teams may have to get closer to the vessel(s) involved in order to be successful and allow for the safety of every one involved. The ultimate goal of everyone involved is to come through every incident with out injury to all persons or vessels that may be involved.

Large volume delivery devices today have obtained as much as 14,000 gallons per minute. The norm today is somewhere around 4,000 to 6,000 gallons per minute. Depending on where the involved vessel is located will dictate the positioning and placement of these devices. For example if the situation is in port, these devices can be placed on the surrounding docks or

ground with care, and reasonable assurances they will not move and create a hazard to all personnel working in the immediate area of the dock. Not so when the situation is on the seas. These devices, including the pumps necessary to supply the water to these devices must be securely fastened to the deck(s) of the vessels being used to combat the situation. When I say secured, this will include welding them to the decks as well as chaining them down to prevent them from breaking loose while involved with securing the situation – regardless of how long this may take. This must be done before ever leaving port to travel to the location of the emergency. One cannot afford to be working toward the safeing of the equipment that is to be used to combat a situation for high sea combat. While length of fire hose requirements on the vessel are limited to the amount of deck space available, the number of hose lines required will be determined by the delivery capabili-

ties of both the pumps and delivery devices being utilized to handle the situation at hand. For example a device delivering 6,000 gallons per minute will require 6-5 inch hose lines from the pump(s) being used to supply the water to the monitor. This can create a very crowded deck, which will make the conditions very unsafe for movement of personnel and equipment. This may become even more crowded if the situation involves the use of hands on fire fighting operations on deck for engine room and quarters. IF fireboats are involved, these vessels usually have their firefighting equipment permanently affixed which means this is usually not a problem. It is those vessels of opportunity that are hired to be used as the firefighting base that will require the safeing of this equipment. This will also include the containers that hold the foam concentrates required for containing and making extinguishment or, if the emergency does not involve a fire, that which is necessary to eliminate the situation. If you have never been on a vessel in motion or on seas that are 10-12 feet or more you may find this difficult to understand. Suffice it to say it is difficult to maintain your footing much less to attempt to combat a serious situation that involves a marine vessel that is also pitching around on the sea. Wave action may in fact halt all operations until it becomes safe to resume what is necessary to bring the operation to a successful termination.

When it becomes necessary to move operations on board the vessel, large volume fire hose – 5-inch or larger – must be laid from the work boat or barge to the involved vessel. It should be noted here that control of the fire must be established before placing firefighters on board. This line or lines must be kept in a position to prevent chafing and eventual leakage. This line(s) become the life blood of the firefighters as they combat any remaining fire(s) on board. They MUST be assured their water flow remains constant and no loss of water is experienced during all phases of the operation-regardless of where it may be. From the large flow line(s) the hand lines must be laid in order for the

*In ports, however, and obviously depending on the nearness of other vessels and structures, the fire teams may have to get closer to the vessel(s) involved in order to be successful and allow for the safety of every one involved.*





*Pic courtesy of Dave Cochran*



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# Shipboard Firefighting

## VESSEL DRAINAGE

Spaces above the normal water line go through the hull into the sea, lake or river. These are called scuppers and are usually small and subject to blockage. Water below the water line goes into bilges. Water must be removed from the highest points first. If sanitary drains are available at floor level, remove the toilet fixtures, shower, or bidet to allow water to flow to holding tanks—which are below the water line. This will help lower the center of gravity. It is advisable to refrain from cutting holes in the vessel to better facilitate draining or other uses. This should only be facilitated only after a review of any consequences and obtaining permission from the appropriate authority such as the ships master, port captain or other expert marine authority.

## FIRE FIGHTING VESSEL

Vessels hired to be used as a firefighting platform may be barges being pushed by tow boats, or large work boats such as those used for offshore drilling operations. If it is at all possible to do so this would be better served if some idea were known ahead of time as to the existing conditions at the sight. It is imperative for the firefighting vessel to be set up for the best and safest method by which to operate. In

## WATER

Water used on vessels is measured in long tons, which is 2,240 pounds per ton. For example:

264 gallons per ton

Salt water = 8.5 pounds per gallon

Fresh water = 8.3/4 pounds per gallon

A 1½ inch line delivering 125 gpm = 30 tons per hour

A 2½ inch line delivering 250 gpm = 60 tons per hour

A 2,000 gpm delivery device = 480 tons per hour

## VESSEL LIST

It is obvious that with the use of large volume delivery devices, water can quickly affect the stability of a vessel. Too much water fore and aft will affect the trim. Too much either way may cause the stern or bow to sink. Too much in both the stern and bow areas may break the back of the vessel and ultimately sink them and bring the center of the vessel up. The keel, which is the backbone, will no longer be of value. Too much water on either the port or starboard side of the vessel will create list to either side. The more water the more the list. If allowed to proceed uncontrolled the vessel may turn upside down.

If it is possible to do so, dewatering must be initiated as quickly as possible. For every gallon of water placed on the vessel, a gallon should be taken off—if it is conceivable to do so. Many times the dewatering cannot begin until access to the vessel has been obtained. Even then it may not be possible to gain access to the onboard pumps. It may become necessary to use pumps

brought with the firefighting team to dewater. Here, another problem confronts the incident commander. Environmental constraints will not permit water that has been placed on board to be pumped into the sea, river, or lake. It will have to be captured into a barge(s), another vessel, or other available source. This is to prevent additional damage to the environment. This places another problem onto the shoulders of the Incident Commander, and a consideration that must be faced before leaving the dock. In the situation where the vessel is tied up to a dock nearby storage tanks may be utilized as well. If the vessel is tied up to a dock, it is better for it to list away from the dock to prevent damage to either the dock or vessel.



*Pic courtesy of Dave Cochran*

some cases the equipment will be set up to operate from either the starboard or port side. Then again some vessels may be set up to operate from the rear of the vessel. Once the decision is made, there is little chance of changing these conditions when the involved vessel is reached. The commitment has been made and there is little chance of changes to be made. All pumps must be positioned close to the sides of the vessel to allow for drafting operations to continue uninterrupted until the situation is eliminated. Consider taking along a spare pump or two just in case Murphy's Law, decides to make a visit. It is advisable to use longer suction hose to eliminate possible air leaks and causing breaks in drafting operations. These can be purchased in 20 or thirty foot lengths; however, the longer the hose the more difficult they are to handle, especially in tight quarters. As previously mentioned heavy rolling seas can prevent pumps from performing. The more suction hose you can put between the pump and the strainer the better off you are. The amount of depth does not affect draft. In addition to this the action of the sea may dictate as to whether or not the captain of the vessel may pull away from the involved vessel if he/she believes the vessel or crew are in danger. The captain will always be in charge-regardless of what the IC feels is right.

The average fire pump is capable of drafting 10-12 feet. However, today there are pumps being tested that will far exceed the previous pump capabilities.

#### HATCHES

If a vessel has ullages or hatches such as those on barges, and they have not been breached or involved, should be left alone. **DO NOT** open them under the pretenses of applying a foam blanket to prevent ignition. In all probability if there are volatile products inside, they are in the rich mode and will remain so. To open them, insert a delivery device, make a foam application, then remove the device until the next application is asking for trouble. When opened vapor will certainly escape, and possibly reach a source of ignition and create another problem to the already bad situation. In addition, if applying foam air is being

inserted both from the suction created by the nozzle, and by the bubbles in the finished foam. In addition, the possibility of a static spark is very likely to occur. Obviously this is not something one wants to happen – it is **not worth the risk**.

If called upon to combat a vessel fire, it is recommended you:

1. Get expert help. The Master of the vessel, Engineer, Captain of the Port, Mates, Salvage companies, Marine architects, all of these are a source of expertise.
2. Know the product(s) involved. Water reactive materials or crude

oils may be involved. Crude oils are subject to boil over. Water reactive materials may react violently.

3. Use the advice of those experts wisely. If you do you may well come out of the situation safely.
4. Don't take unnecessary chances – the firefighting profession often times requires firefighters to be placed in some area of hazard. Shipboard firefighting may force one to be in the red zone.
5. If possible get copies of the ships papers – they will give you the information about the vessel you are boarding.



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# Aircraft Rescue

THE CRASH OF A commercial jetliner raises the specter of such overwhelming death and destruction that most people would rather not consider the possibility. Unless a community is in close proximity to an airport, it is often difficult to get the commitment of resources to plan for such an event. However, it is the responsibility of emergency managers to plan for the unthinkable. For those individuals who insist that these types of incidents only occur "someplace else," remember that to emergency managers in other municipalities, your community is somewhere else.

In this series of articles, we will consider the role of fire, law enforcement and EMS agencies when responding to an off-airport aircraft crash. In this issue, we begin by reviewing aircraft rescue firefighting.

## AIRCRAFT RESCUE FIREFIGHTING

Aircraft rescue firefighting (ARFF) encompasses the techniques, tactics and skills utilized to maximize the number of survivors of an aircraft crash. This involves the use of specialized and sophisticated equipment, and the implementation of specific strategies and tactics, with priority being placed on rescuing the greatest number of victims in the shortest period of time.

In order to certify them as airworthy, manufacturers of commercial jetliners must demonstrate that their aircrafts can be evacuated of their full capacity in under three minutes, utilizing only half the available exits.<sup>1,2</sup> However, a jet aircraft can still be compared to a crowded movie theater with too few exits to pass any building code in the country.

Due to the nature of the combustibles involved in an aircraft crash, the physical forces which are experienced and the potentially large number of victims, strategic priorities differ from other types of firefighting scenarios. In ARFF, the emphasis is more heavily weighted toward rescue than in struc-

tural firefighting. With a potential 300+ victims, many of whom will have suffered burns and/or traumatic injuries and are in need of extrication, all available resources must concentrate on the rescue effort. This often involves the tactical decision to ignore a large body of fire until after rescue of the passengers and crew is accomplished.

The rule of thumb is initially to fight only the fire that interferes with the rescue. Once the rescue is completed, resources can then be redirected to firefighting. This is in contrast to a structural fire response, where saving the bedrooms from a kitchen fire is considered a win. After all, you can't save half an airplane!

## ARFF TECHNIQUES

Techniques initially employed in the response are geared toward extending the "escape window" to allow the evacuation of passengers and crew.

Aviation fuels burn at extremely high temperatures, between 3,000°F-4,000°F. The environment inside an aircraft cabin can reach uninhabitable temperatures within two minutes. By employing the

**By Kenneth D. Honig,  
EMT-P, CEN**

"area concept" technique of blanketing the outside of the fuselage with overlapping streams of firefighting product to draw off heat, escape time for passengers can increase significantly.

Tests conducted at the Federal Aviation Administration's (FAA) research facility at Atlantic City Airport in New Jersey demonstrate that a fuel fire inside an aircraft cabin can reach temperatures that lead to flash-over conditions in less than four minutes. The immediate application of massive quantities of cooling firefighting product to draw off this heat is the most effective technique for increasing survivability in a low-impact aircraft crash fire incident.

When planning a fire attack, certain basic principles should be employed. The responding firefighting force should make the initial attack from upwind of the fire. This allows nature to reduce the amount of heat and smoke these firefighters will encounter. Remember that structural firefighting protective clothing provides inadequate protection against extreme temperatures generated by burning aviation fuels. When approaching the scene, firefighters should realize that due to their limited initial firefighting capacity, they should not waste time or product extinguishing fires that do not involve passenger areas. Burning wings, engines and landing gear do not normally contain passengers, and unless the fire is encroaching on passenger or other inhabited areas, it should be ignored

# e Firefighting

until passenger rescue is complete.

The first priority is to create and maintain a rescue/escape path for passengers evacuating the aircraft. Secondly, product should be applied to cool the areas of fuselage where radiant heat from a fire has begun to encroach. Finally, after the passengers' safety is established, and if sufficient quantities of firefighting product are available, mop up of other areas can begin.

## PREPARATION CONSIDERATIONS

In order to prepare for an aircraft emergency, agencies should become familiar with how airports deal with on-site incidents.

The FAA has promulgated Federal Aviation Regulations (FARs) on a variety of subjects involving operations of aircraft and airports. FAR Part 139 [14CFR Part 139] deals with, among other things, aircraft rescue and firefighting. Part 139 details the required areas of training for aircraft rescue firefighters, and specifies the type and capacity of equipment available to respond to such incidents.

Aircraft rescue firefighting vehicles can be categorized into four types: rapid intervention vehicles (RIV); large capacity foam vehicles; tankers; and miscellaneous ancillary vehicles.

**Rapid intervention vehicles** quickly deliver a sufficient quantity of firefighting product to extinguish a small aircraft fuel fire or knock down a large fuel fire. Personnel on this equipment will also make the first evaluation of the incident and begin rescue operations. These vehicles carry 100-1,000 gallons of water and aqueous film-forming foam (AFFF), as well as a secondary extinguishing

agent (Halon, carbon dioxide or dry chemical powder). To meet FAA mandated standards, this vehicle must be able to reach the midpoint of the furthest runway from the fire station and begin firefighting operations in three minutes or less from the initial alarm.

**Large capacity foam vehicles** carry up to 6,000 gallons of water and AFFF. They discharge firefighting foam through turrets at up to 1,200 gallons per minute or more, as well as through hand lines and under truck nozzles. They must be able to arrive at a scene within four minutes after an alarm is sounded.

**Tanker vehicles** may be utilized to transport large quantities of water or foam concentrate to the scene for replenishment of ARFF vehicles.

Other vehicles in an ARFF fleet may include command and communications vehicles, stair trucks, ambulances, MCI equipment carriers, hazardous materials/decontamination units, ladder and hose trucks.

The FAA makes yearly surprise tests of response time, equipment and training records. Failure to meet mandated standards can result in hefty fines and/or loss of certification.

## FIREFIGHTING PRODUCTS

Class B firefighting foams are the primary agent used for fighting aircraft fires. Foam is defined in NFPA Standard-11 as "a stable aggregation of small bubbles of lower density than oil or water, and shows tenacious qualities for covering horizontal surfaces." Foam is made up of air, a foaming agent and water. It is the air trapped in the bubbles that gives foam its cooling ability.

The first chemical foams were developed in England in the late 1870s. The United States Army Air Corps began using chemical foams formed by reactions of such materials as aluminum sulfate or sodium bicarbonate and water, in combination with foam-stabilizing agents, in the 1930s. In 1935, the Army switched to mechanical foams where a liquid foaming agent is mixed

*Aircraft rescue firefighting vehicles can be categorized into four types: rapid intervention vehicles (RIV); large capacity foam vehicles; tankers; and miscellaneous ancillary vehicles.*



# Aircraft Rescue

with water and air. Examples of these mechanical foams include protein foams, which are albumin based, and fluoroprotein foams, in which glycols were added to stabilize the foam.

In the 1960s, the United States Navy, along with 3M, developed Aqueous Film Forming Foam (AFFF). AFFF is totally synthetic and contains fluorocarbon surfactants which cause a thin aqueous film to drain from the foam bubbles and float on top of the liquid hydrocarbons. This traps the vapors and results in fire extinguishment by removing the fuel source. In addition, the cooling action of the bubbles removes the heat, resulting in faster extinguishment.

Firefighting foams are generally available in 1%, 3% and 6% concentrates. The percentage refers to the number of gallons of concentrate to be mixed with water to produce 100 gallons of firefighting product. For example, one gallon of 1% AFFF concentrate is mixed with 99 gallons of water, three gallons of 3% concentrate is mixed with 97 gallons of water, or six gallons of 6% concentrate is mixed with 94 gallons of water to make 100 gallons of product. What comes out of the nozzle or turret is exactly the same. Since mobile proportioning systems cannot be accurately calibrated at the 1% level, these concentrates are utilized only in fixed-base operations such as refineries and fuel storage facilities and are not used for ARFF.

## VEHICLE ADAPTATION

Many municipal fire departments are not financially able to purchase an ARFF

*Firefighters should be familiar with, and have available, foam eductors and a supply of foam concentrate at the scene to continue firefighting efforts.*

vehicle to stand by in the event a plane crashes in their community. Therefore, agencies must determine how to adapt existing structural firefighting equipment for ARFF.

One of the simplest and least expensive methods is calculation of the booster tank foam recipe for your equipment. This involves taking the capacity of the on-board water tank on the fire truck, calculating the amount of foam concentrate needed, and then storing it on the truck ready for use. For example, a 500-gallon booster tank would require 15 gallons or three 5-gallon buckets of 3% AFFF concentrate. Placed in the hose bed near the tank fill, the foam concentrate could be dumped into the tank before the apparatus departs. The drive to the scene would sufficiently mix the water and concentrate to produce 500 gallons of pre-mix. With a standard water fog nozzle, this would produce the firefighting equivalent of 1,500-3,000 gallons of firefighting product. If an air aspirating nozzle was utilized, then the coverage would approximate 1,500-7,500 gallons.<sup>3</sup> Firefighters


should be familiar with, and have available, foam eductors and a supply of foam concentrate at the scene to continue firefighting efforts.

Although it is possible, but not desirable, to apply protein foams along with AFFF on the same fire, water should never be applied to a foam blanket as it will dilute and wash away the protection. It is also important not to mix different types of foam concentrates together. To insure the safety of rescuers and to prevent possible reignition of fuel vapors, when the foam blanket has dissipated, it should be replenished. A visible and complete foam blanket is necessary to insure vapor suppression.


## RESPONSE PLANNING

Off-airport aircraft emergencies fall into four categories: low-impact crashes, high-impact crashes, mid-air break up and crashes into water.


In a low-impact crash, the pilot is able to make a fairly controlled landing and the fuselage remains relatively intact. There may be an associated fuel fire. Responders will treat a large




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# Firefighting

number of survivors suffering from force injuries and burns. The local EMS system will be overloaded. A wide body jet may carry up to 400 passengers, and appropriate hospital beds will have to be located.

In a high-impact crash, the forces involved are much greater and there will be few, if any, survivors. The stress on responders increases as it becomes apparent that few lives can be saved. The clean-up operation, body recovery and identification process will tax the local medical examiner or coroner's staff.

If the aircraft breaks up in mid-air due to an explosion or collision, aircraft wreckage and bodies may be spread over a wide area. If the aircraft lands in water, reaching the fuselage, rescuing survivors and combating a fire will be difficult. In these cases, even a shallow water crash will have severe environmental consequences.

Response planning should include designation of primary and back-up locations for triage and treatment of victims. Suddenly you are faced with 325 victims with injuries ranging from minor abrasions to fractures, burns and major trauma. Where will you treat them? How many hospital beds are available? How will you transport patients?

Devise a plan and conduct a tabletop exercise to test it. Include neighboring fire, EMS and law enforcement agencies in your exercise. Disaster drills and exercises are the time to work out mutual aid bugs. Also, contact the local funeral home association to assist in planning for a multiple fatalities incident. Contact state and federal agencies for potential sources of assistance, from FAA Planning Guides to DMAT Teams.

In any event, responders to an aircraft crash will have to take special precautions to protect themselves. Beyond the obvious danger of fire, unburned jet fuel is a carcinogen that can be absorbed through the skin; prolonged inhalation of vapors can lead to development of chemical pneumonia; and some equipment can be permanently contaminated if it comes into contact with fuel.

Aircraft fuselage may produce sharp edges that can easily tear through bunker gear. Aircraft landing gears are made of materials that will burn at extreme temperatures and react violently if extinguishment with water or foam is attempted. Aircraft engines may continue to operate for some minutes after a crash, even if they have become dislodged. In an emergency landing or low impact crash, jet turbines may produce sufficient thrust to overturn responding apparatus and suck in loose equipment or even personnel who get too close. A bump against a propeller can restart a reciprocating engine if it has not been properly shut down. Pressurized lines and containers may contain fluids or gases at extremely high pressures. Some of the fluids may be flammable or toxic. In older aircraft, oxygen may be distributed from central tanks through pressurized lines. Surface control cables can be under extreme tension, and if cut, may react with enough released energy to cause serious injury or death. Electrical lines may remain energized.

The new composite skin of modern aircraft is made up of materials that when cut by a power saw can release dangerous

dust and micro fibers. Responders must also take care to avoid the biohazard dangers presented by body parts and fluids, and to avoid unnecessary contamination of equipment by carefully choosing equipment staging sites. A decontamination station for personnel and equipment should be established, and a perimeter established to prevent cross contamination.

During and following ARFF operations, it is important to remember that a plane crash is a crime scene until proven otherwise. A number of local, state and federal law enforcement agencies will be involved in the investigation into the cause of the crash. Responders should take care not to unnecessarily disturb aircraft parts. If it is necessary to move something in order to accomplish rescue or fire extinguishment, then try to remember the original location or orientation of the part and convey that information to investigators. Above all—no souvenir hunting! A perimeter should be quickly established and only those persons actively involved in the operation should be permitted access. Preventing unauthorized access is infinitely easier than clearing the area of bystanders later.

Before recovery of bodies or body parts commences, photographs should be taken to document their location in relation to the aircraft and surrounding area. This

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*The combination of a massive, three-dimensional liquid hydrocarbon fire, a widespread trauma and burn MCI, and a high-profile media event makes this an extremely difficult situation to prepare for.*

documentation may assist in identification of parts and research into what steps can be taken to improve crash survivability in the future.

All involved personnel should be strongly encouraged, if not mandated, to participate in Post Incident Stress Debriefing. This type of incident exposes responders to a situation outside of normal human experience and long-term mental health dangers cannot be overlooked. Recovery of the community should also be encouraged. As soon as possible following the event and investigation, clean-up of the area and restoration to pre-crash conditions

should be accomplished. Residents should be offered counseling and be involved in the restoration in order to restore a sense of control.

An airplane crash is not simply a big automobile accident. The combination of a massive, three-dimensional liquid hydrocarbon fire, a widespread trauma and burn MCI, and a high-profile media event makes this an extremely difficult situation to prepare for. However, the careful planning and training you will do in order to deal effectively with this type of event will also improve your response to other types of emergencies.

## REFERENCES

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# Full-scale mobilization

## Heavy exhibitor response



**THINGS ARE BOOMING AT INTERSCHUTZ 2005.** For months now, the trade show team has been involved in a full-scale mobilization. "We're

represented with its own generous-sized information stand (in Hall 27).

### RUSSIA TO PRESENT TWO NATIONAL PAVILIONS

At a total of two national pavilions, the Russian Federation will present its latest disaster relief equipment and techniques. Demonstrations include firefighting missions, disaster prevention and damage control, rescue and recovery work and special training in the area of risk analysis and management.

The Russian ministry for disaster protection (EMERCOM RUSSLAND) will demonstrate how forest fires are extinguished using heavy airplanes, helicopters and multi-purpose amphibian planes as well as how robots are deployed for firefighting and environmental recovery purposes.

The program is rounded out by a presentation of new technologies for fire protection in underground and multipurpose structures as well as high-rise buildings.

The Russian Federation will appear at INTERSCHUTZ in Hall 26 as well as at INTERPOLICE in Hall 27.

### Additional national pavilions

Apart from Russia and the host nation of Germany, the following six nations have registered their own pavilions: Finland, France, Poland, Russia, Spain and the United States.

### RESCUE AND FIREFIGHTING MISSIONS

#### Live demonstrations at the open-air site

A major bonus at INTERSCHUTZ 2005 is its balanced mix of non-commercial and industrial exhibitors, helping make this trade fair into the world's top event for anyone involved in rescue services, fire prevention, disaster relief and safety/security occupations.

The industrial exhibitors will display

especially from outside Germany," reports a member of the INTERSCHUTZ project team. All the market leaders have already registered for the "International Exhibition for Rescue, Fire Prevention, Disaster Relief, Safety and Security" at the Hannover Exhibition Center, running from 6 to 11 June 2005. Leading companies from Sweden, Spain, Portugal and Poland will be represented in Hannover for the first time ever. All in all, the organizers at Deutsche Messe AG are expecting to draw over 1,000 exhibiting enterprises, institutions, organizations and associations for the exhibition, occupying halls 12, 13, 26 and 27 at the exhibition center, as well its open-air site.

### INNOVATION A BURNING NECESSITY

#### Rescue services and security in the spotlight

Fire brigades, the police and relief agencies are faced with ever-more complex challenges, be it helping with natural disasters, severe accidents, fire or international terror prevention. Given the high priority of security-related issues, this topic has been made into a new, independent trade show category by the organizers of INTERSCHUTZ/INTERPOLICE 2005. This means that in 2005, the emergency services sector will be emphasized even more than at past shows. And the entire exhibition program is being realigned and expanded to cope with this new development.

Exhibitors at the event will be displaying the latest technologies, trends and services in the area of protection and prevention, emergency relief and civil defense plus organization.

The range of products and services runs from protective clothing and emergency and medical equipment to the latest-model rescue vehicles. Additional areas include position-finding equipment, measuring and detection systems, control center and signaling equipment, fire and building protection

and equipment for rescue vehicles, fire stations and workshops.

Successful operations depend on having up-to-date technical equipment, monitoring systems and communications technology. Visitors at INTERSCHUTZ/INTERPOLICE will be able to see all the latest developments here firsthand.

The "Security" category at the show will feature products and services for access, security and monitoring systems in industry, transportation and the home.

The INTERSCHUTZ team is expecting visitor attendance of around 130,000.

### SUCCESS AT "CHINA FIRE" TRADE SHOW

Deutsche Messe AG did some highly successful advertising for INTERSCHUTZ/INTERPOLICE 2005 at the "China Fire" trade show, held last October in Beijing. The Hannover-based exhibition company was represented at the official German pavilion there. As a result, more than 25 Chinese companies, primarily from the area of fire extinguishers and extinguishing agents, have already signed up for INTERSCHUTZ/INTERPOLICE 2005 (versus just six companies in 2000). For the first time ever, the Chinese association of fire brigades (CFPA) will also be



all the latest products and technologies required for optimum performance by rescue and security services.

The non-commercial exhibitors, on the other hand, will be on hand with their primarily volunteer crews to reconstruct realistic damage scenarios and simulate rescue missions. Every day, from 10:00 a.m. to 5:00 p.m., a series of spectacular demonstrations and activities will take place at the 8,000-square-meter large demonstration site on the north side of Hall 26. The main focus will be on the key topics at INTERSCHUTZ, i.e. fire prevention and firefighting, as well as rescue missions of all kinds. This part of the show is being organized by the Hannover Fire Department.

#### SPECTACULAR RESCUE MISSIONS

A live demonstration will feature a cut-away airplane in which the jet engine and landing gear are on fire and need to be extinguished. In addition, visitors can see how a large-scale fire on an area measuring 100 square meters – similar to the aftereffects of an airplane crash – are extinguished by an airfield firefighting vehicle at a distance of 50 meters.

Another treat for viewers will be to see how professional firefighters gain access to burning buildings using a “flashover” simulator container, as demonstrated by the firefighting school “Landesfeuerwehrschule Celle.”

Due to the fact that the simulation sites need to cool down after each demonstration, these demonstrations will only be offered twice daily.

The rescue services will be featured heavily at INTERSCHUTZ 2005 and shown in all their facets: rescue missions involving traffic accidents, chemical explosions, fire and natural disaster, taking place at great heights or on water or ice.

#### LARGE-SCALE RESCUE MISSION FOLLOWING BUS ACCIDENT

The Hannover Fire Department is celebrating its 125th anniversary by appearing on a large stand in Hall 27 measuring 1,000 square meters in size and presenting several spectacular live demonstrations at the demonstration site. One of these will involve a major rescue mission following a bus accident

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with many injured victims. A high-altitude rescue mission to save a helpless person will also be simulated. A special highlight for firefighting specialists will be to see the new fire department crane in action, with a lifting capacity of 60 tons.

**Contact:**  
**Hannover Fire Department**  
Heiner Steding  
Phone: +49-(0)511/912-1542

#### MARITIME RESCUE SERVICES

The German Sea Rescue Service (DGzRS) will be on hand to inform the interested public about its maritime search and rescue work. A key focus of its presentation is the “Hermann Marwede” sea rescue ship, commissioned in 2003. A model of the ship will be on

display, and visitors can watch a video on its initial missions in the German Bight.

**Contact:**  
**The German Sea Rescue Service**  
Holger Stucke: +49-(0)421/53 707-666  
[www.dgzrs.de](http://www.dgzrs.de)

#### RESCUE DOGS

The German federation of rescue dog associations will be joined by Technisches Hilfswerk and additional organizations in demonstrating the use of rescue dogs to locate injured, trapped or missing persons.

#### TECHNISCHES HILFSWERK (THW)

Rescue work is at the heart of the presentation by “Technisches Hilfswerk”, Germany’s disaster relief organization

(THW). On a stand measuring 1,400 square meters in Hall 26, with an extra 400 square meters outdoors, this organization will demonstrate new equipment for difficult technical rescue assignments as well as new rescue vehicles. In Hall 26 THW will present a "reconstructed" collapsed building with people "trapped" inside its cavities. THW members will demonstrate how they are located using electronics and rescue dogs. A steel-pipe structure on the outside of Hall 26 will be used to demonstrate rescue missions at significant heights or depths. This structure will be converted into a climbing wall for the public on Saturday – Open Door Day at the show.

**Contact:**

**Technisches Hilfswerk**

State Chapter for Lower Saxony/Bremen  
Rainer Bormann  
Phone: +49-(0)511/336 90 50

**GERMAN RED CROSS (DRK)**

The German Red Cross will be presenting new rescue vehicles and its familiar blood donation mobile. It will also be introducing its new victim support and information unit (UEBI) to the broad public for the first time. This German-wide project involving medical and social care of affected residents and support teams at chemical accident sites was launched in summer 2002 by Hannover-based local helpers. Their job consists of informing people onsite of the hazardous chemicals released into the environment as well as providing advice to mission control, helping look after patients and decontaminate any affected people.

**Contact UEBI:**

**German Red Cross**

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state-of-the-art police lights.

Starting in late January, this police car will be used to advertise INTERSCHUTZ/INTERPOLICE 2005 throughout Germany, including at the Motorola company stand at CeBIT in March. The provisional end of the line for this vehicle will come at INTERSCHUTZ/INTERPOLICE in June, where interested visitors can examine the car and its amazing equipment in Hall 12.

**DIGITAL WIRELESS COMMUNICATION FOR EMERGENCY ORGANIZATIONS**

Starting in 2010 all authorities and organizations with security-related missions in Germany will use the same, standardized wireless communication network. Germany's federal and state governments are currently working full-speed to achieve this objective. The current schedule calls for invitations to tender to go out to system providers by this spring. In 2006 the decision will then be made as to which systems technology will be adopted for all emergency services and organizations in Germany.

Visitors to the show can stop by the stand of the Lower Saxony Wireless Communication Project Group in Hall 27, stand F 13, to find out what extraordinary prospects will result from

having a standardized, wireless security communications network.

This program is complementary to a presentation sponsored by Johanniter Unfallhilfe (JUH) entitled "An introduction to digital wireless communication" on 8 June, from 10:00 a.m. to 12:00 noon.

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To ensure you have a stress-free visit to the show, Travel2Fairs, a subsidiary of Deutsche Messe AG, is happy to organize your accommodations in a hotel or private home (B&B). Hotel rooms are available in every price category, as are reasonably priced B&B or apartment accommodations. You'll find the relevant order forms – form 7.85 and 7.86 – in OBS.

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- 333 TFL – 33 m platform, outreach 25 m, cage load 400 kg
- 383 TFL – 38 m platform, outreach 22 m, cage load 400 kg
- 453 TFL – 45 m platform, outreach 26 m, cage load 400 kg
- 553 TFL – 55 m platform, outreach 23 m, cage load 450 kg

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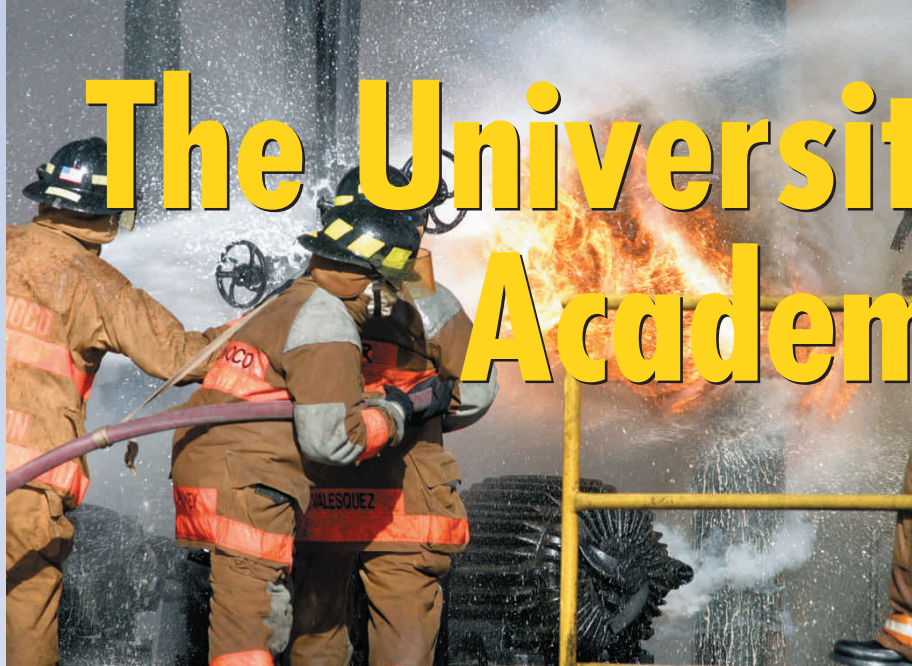
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# Fire and Rescue Training







# The University of Nevada Fire Science Academy in Carlin

and governments in the preparation for, management of and recovery from crises and emergencies. Training focuses on incident simulations, command systems, strategies and management tactics for crises ranging from natural disasters to man-made emergencies and terrorism.

Courses and consulting in incident management include:

- Incident Command and Emergency Response
- Incident Command System (ICS) for Emergency Medical Services (EMS)
- Incident Safety Officer
- Developing and Implementing Tabletops, Drills and Exercises
- Hazardous Materials On-Scene Incident Commander

OFFERING ONE OF THE finest emergency response programs and training facilities in the world, the University of Nevada, Reno Fire Science Academy (FSA) includes a state-of-the-art training campus in Carlin, Nevada, USA, as well as specialized training programs that can be conducted at the academy or customized and offered anywhere in the world.

The FSA's vast hands-on training facility and comprehensive programs are designed to challenge experienced and novice firefighters alike, serving private-sector industries including petrochemical, aviation, mining, technology, transportation and hospitality as well as municipal, county, state, federal and international agencies and governments.

Backed by 30 years of training expertise, the academy's instructors, industry experts and staff support a renowned classroom curriculum augmented by exceptional hands-on training exercises for real-life incident command and response. FSA training on the field and in the classroom meets or exceeds consensus standards and those set by the U.S. Occupational Safety and Health Administration (OSHA), the U.S. Mine Safety and Health Administration (MSHA), the Federal Aviation Administration (FAA), the U.S. Department of Transportation (USDOT), the National Fire Protection Association (NFPA), the Federal Emergency Management Agency (FEMA), and the Nevada State Fire Marshal. Continuing education credit for FSA coursework and training also may be available from a variety of agencies and organizations.

## PROGRAMS AND TRAINING EMPHASIS

The University of Nevada, Reno's Fire Science Academy has earned an international reputation for exceptional, safe, effective, flexible and responsive training and consulting. FSA delivers the

latest methods and technologies available, providing state-of-the-art, hands-on and classroom training to develop individual competencies through team-based learning. Companies and individuals may train at the world-class Nevada facility or have a program or course customized and offered at a site anywhere in the world.

## CRISIS AND EMERGENCY MANAGEMENT

Establishing effective command, control and communications at any emergency is vital for the safety of rescuers, victims and the public. These systems also play a dominant role in effectively managing an incident and returning chaos to order. The FSA trains industries, organizations



## HAZARDOUS MATERIALS AND HAZWOPER

Training for hazardous materials response is so specific that legislated standards have been set to guide responders through advancing levels of command. FSA training meets or exceeds these requirements. The FSA trains in containment, confinement, decontamination, first responder and incident command with strenuous exercises using heavy, chemical-protective clothing. Instruction emphasizes protecting people, property and the environment.

Courses and consulting in hazardous materials response include:

- HAZWOPER 24-Hour/Hazardous Materials First Responder Operations
- Hazardous Materials On-Scene Incident Commander
- HAZWOPER 40-Hour/Hazardous Materials Technician
- HAZWOPER 8-Hour/Hazardous Materials Refresher
- Hazardous Materials Advanced Response
- Hazardous Materials Chemistry
- Emergency Response Team (ERT) – Comprehensive Refresher Training

## INDUSTRIAL FIRE FIGHTING

The FSA has received worldwide recognition for its industrial curriculum,

# University of Nevada, Reno Fire Science Academy, Nevada, USA

training props, use of liquid petroleum fuels and its hands-on approach to instruction. FSA has trained firefighters from all 50 states and nearly 40 countries. Specialized industrial environments such as fuel production and pipeline operations can be emphasized with live fires, tactical drills and advanced techniques in a controlled environment. Courses meet or exceed legislated requirements and consensus standards for industrial responders.

Courses and consulting in industrial fire fighting include:

- Entry Level Industrial Firefighter (also available in Spanish)
- Advanced Exterior Industrial Firefighter (also available in Spanish)
- Industrial Fire Brigade Leader (also available in Spanish)
- Industrial Firefighter Refresher
- Emergency Response Team (ERT) — Comprehensive Refresher Training
- Industrial Firefighter Certificate Program (also available in Spanish)

## AIRCRAFT RESCUE AND FIRE FIGHTING (ARFF)

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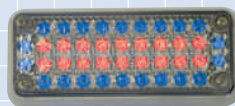
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LANCASHIRE FIRE AND RESCUE SERVICE's Head of Training, Dave Paton stated that:

"The emergency services must make strenuous efforts through multi-agency training to prepare for any large scale incident involving hazardous materials, whether accidental or deliberate. Many people believe it is not 'if' this country will be subjected to a terrorist attack involving chemical, biological, radioactive or nuclear (CBRN) materials, it is 'when'."

Incidents involving hazardous materials (Hazmats) have changed dramatically over the past few years for many reasons, not least the increased threat from terrorist organisations utilising Chemical, Biological, Radiological and Nuclear weapons.

The Fire Service have long been involved in the containment and management of incidents involving the accidental release of hazardous materials.

The training applied in dealing with Hazmat incidents, safe systems of work, risk assessments, decontamination of Fire Service personnel, decontamination of the general public, and the issues affecting the environment, is extremely intense and extensive.

#### HAZMATS

Throughout the United Kingdom, pre-planning is an essential element of responding to an incident involving Hazmats. In most cases, type, location and quantity of Hazmats is known, due to the requirements imposed on a fire authority under current legislation.

Based upon this knowledge (which is usually obtained by inspection) methods of dealing with such incidents and the personal protective equipment required is known by potential responders. However, transportation of chemicals and Hazmats is obviously a little more difficult to predict.

Disposal of chemicals is an ongoing problem internationally. This results in



*Pic courtesy of Washington Hall*

**By Gary West, CertEd**

reclamation companies running a business to dispose of chemicals. Difficulties resulting from this, which firefighters quite often have to deal with, are mixtures of unknown and unlabelled chemicals gassing off uncontrollably. Consequently having the correct methods to deal with the incident and Personal Protective Equipment become critically important.

Following mobilisation to a Hazmat incident, exact information on the route to an incident regarding the slope of the ground, wind direction and other meteorological issues is vital. In the UK, a scheme referred to as 'CHEMET' is provided. This is a nationwide service available on a specially selected network of meteorological offices. The offices are open permanently, and are staffed by experienced forecasters.

Also available nationally is a scheme referred to as 'CHEMSAFE'. This is the United Kingdom Chemical Industry response scheme for providing rapid, expert advice and support in the event of an emergency during the distribution of chemical products. It applies to all chemicals, not just those which are classified as hazardous. CHEMSAFE is primarily intended for land based incidents including those at docks, harbours and airports. The scheme basically ensures



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that an appropriate and co-ordinated response is made to minimise any potential adverse effects of an incident to both the public and the environment.

During the emergency phase of an incident, supervisory officers (with an enhanced knowledge of Hazmats) are mobilised. Their role is to provide valuable support to the incident commander at known chemical incidents, and they should remain dedicated to this task throughout. This officer should provide the technical advice, procedural guidance and logistical support for the incident commander.

On arrival at an incident (and once the Hazmat has been identified) more in depth information on the substance involved, level of protection required, and methods of dealing with the incident can be obtained via a centralised Control Centre. The information that they are able to provide to officers at the scene is via a computer programme referred to as 'Harwell Chemdata'. This programme is designed to run on a micro processor enabling Control to rapidly identify those properties of chemicals which will be of value to the Incident Commander. The data bank provided with the programme contains many thousands of entries and is available to the National Chemical Emergencies Centre at the Harwell Laboratory of the United Kingdom Atomic Energy Authority. The programme is provided to the Fire Service under a licensing agreement which ensures regular information updates in order that the incident can be tackled using the most effective methods.

The information available from this scheme includes the product name, the emergency action code, the hazards to personnel and the environment, the physical form, precautions to be taken, what to do in case of fire, the substance identification number, the UN hazard class, the ADR/RID code, the CEFIC TREMCARD, specialist advice available, preferred decontamination method (wet/dry), IMDG CODE (International Maritime Dangerous Goods), the NFPA Code (National Fire Protection Association), and the type of First Aid that can be administered.

Transportation of Hazmats presents a different problem. In the UK, The Carriage of Dangerous Goods by Road Regulations 1996 determines the criteria necessary to undertake such transportation. There are two forms of hazard identification permitted under the above regulations, the HAZCHEM Code and the ADR number. Vehicles carrying such a substance must display three Hazard



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*Pic courtesy of Washington Hall*

Warning Panels known as UKTHIS labels (United Kingdom Transport Hazard Identification Scheme).

Information provided on this label consists of The Emergency Action Code, The United Nations number, a Hazard warning sign, a number offering Specialist advice, and the manufacturer's name or house symbol.

### DECONTAMINATION

A National Memorandum of Understanding has been agreed in the UK between the Office of the Deputy Prime Minister and the Department of Health which gives the function for Mass Emergency Decontamination to the Fire Service.

Prior to addressing the structure of how these procedures have been implemented to within the Fire Service, it is important to ascertain the procedures currently in situ, and how resources manage Hazmat incidents prior to mass decontamination procedures being applied.

There are four levels of response to a Hazmat incident:

- **Level One** – First Attendance Response
- **Level Two** – Brigade IRU (Incident Response Unit)
- **Level Three** – Regional IRU
- **Level Four** – National Response

During a level one response, normal brigade decontamination procedures will apply for both the general public and for the firefighters themselves. This normally takes the form of setting fire appliances in a position where the public are able to walk between them and

be showered from above, although it is widely believed that 80% of the contaminant on a person can be removed simply by undressing. The level one response may also involve the use of the CIU (Chemical Incident Unit) and the ISU (Incident Support Unit) in order to facilitate decontamination generally.

As with every Hazmat incident scene, clean and dirty areas must be distinguished, with a clearly defined inner and outer cordon.

Early decisions must be made by the officer in charge bearing in mind issues such as gradient of the land, wind direction, the nature of the chemical, the degree of decontamination required, the type of personal protective equipment necessary, the risk to the environment, water supplies and drainage facilities, as well as all other necessary agencies and resources which may need to be contacted.

Currently, it is the Ambulance Service



*Pic courtesy of Washington Hall*

who are responsible for the decontamination of the general public, but on occasions in the past, it has been necessary to work alongside the Fire Service due to a variety of issues, not least numbers of victims requiring decontamination.

Following extensive trials by the Home Office Fire Experimental Unit (1995), it was concluded that the most effective method of decontamination was achieved by using a suitable detergent, water and scrubbing brush, followed by a full rinse.

Despite Accident and Emergency Departments and the Ambulance Service being more than capable of implementing this, since '9/11' it has become necessary to impose contingency plans and responsibilities for decontamination of many people at any one time. In a situation where mass public decontamination is required, theoretically all authorities involved would be attempting to achieve decontamination of 20,000 people in around 8 hours.

In order to achieve these targets and to be capable of responding and reacting to a potential chemical, biological, radiological or nuclear related incident, the Government has supplied equipment and appliances in vast numbers.

As a result of this and following the interim measures imposed by a Fire Service at this type of incident, the levels of response for the 'Incident Response Units' were determined.

These are:

- **Level One** – Brigade Response
- **Level Two** – Brigade IRU
- **Level Three** – Regional Response
- **Level Four** – National Response

For a Level Four incident, the potential of 300 appliances attending is a fairly realistic estimation. This apart, the numbers of other vehicles, personnel, and resources necessary, combine to determine the extreme levels of control necessary to successfully conclude such a scenario.

As with any type of incident where decontamination is required, the area is usually split into three; the 'hot zone,' 'warm zone,' and 'cold zone.'

The Fire Service is responsible for all personnel within both the hot and warm zones. Once successfully decontaminated, within the cold zone, the Ambulance Service will triage the victims again, and decide whether or not they must attend at hospital, or be taken to an appropriate rest centre.

It is widely believed that for one incident response unit, 400 persons could successfully be decontaminated per hour. This of course is not always going to be achievable. For example, should some of the victims also be casualties, and require a further level of assistance in decontaminating themselves, the process is naturally going to be a lot slower.

For this potential problem, the vehicles have been stowed with decontamination equipment adaptable for victims who are either ambulant or non-ambulant, and are still subject to the disrobe, three-minute wash/rinse cycle, and re-robe procedures in situ.

Although Hazmats and Decontamination are extremely intense subjects, the basic principles applied within the Fire Service have been covered above. It is important to understand however, that no two incidents are the same. For example, the type of hazard, location of hazard, nature of hazard, what form the hazard is in (liquid/gas etc), quantities of the hazard, and numbers of victims and casualties who need decontaminating can vary enormously. It is also very important to impose some form of containment, not only of the Hazmat, but also of the persons contaminated. Should the second point not be admin-

istered, the potential of the 'hot zone' then becomes almost uncontrollable. If victims are wandering all over the place, possibly even attempting to self facilitate their own decontamination at the local hospital, consequently this also becomes contaminated.

To conclude briefly, in support of the previous statement, the quality and level of control at an incident involving Hazmats has to be maintained at the highest possible standard, from development of the incident, right through to the conclusion of the decontamination process.

Gary West, CertEd is a Course Director at Washington Hall International Training and Development Centre.

Gary sits on a national body for the New Dimensions Project. This project is driven by the Government's responsibility to meet the threat of modern day terrorism in terms of resources, specialist equipment and expertise. His work involves designing and developing standards to be adopted nationally to meet this threat.

For further information please contact:

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*Continuing with customer service development, Washington Hall would welcome any comments you may have about the information contained within this article. Please email our Client Liaison Officer [lynnrigby@lancfirerescue.org.uk](mailto:lynnrigby@lancfirerescue.org.uk).*

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# Selecting Outside Training Providers to Maximize Your In-House Training Programs

*Pic courtesy of Fire Science Academy*

**MANY EMERGENCY RESPONSE TEAMS**, whether they are volunteer, paid, industrial or municipal, can improve their state of readiness by expanding their in-house training programs through the use of outside training providers, a strategy which offers benefits and some risks to the hiring organization.

One of the perceived solutions to increasing responder safety and performance is to spend money on equipment. Monitors, power saws, lifting bags and other specialty appliances are found in the apparatus of most responding organizations. Often what is not found is recurrent training to use these tools effectively. How does this happen? Normally the customer receives initial training on equipment from the vendor, provided free to an organization's training specialists along with the OEM manual(s). Training specialists then train the ranks to an acceptable level, but occasionally the full advantage of the new equipment is not fully realized.

Another problem is that equipment may be thought of as independent of other more primary equipment on an apparatus. Consequently, not until a response drives the need to use multiple pieces of equipment does the need for training on all components of the apparatus become apparent.

## **BENEFITS OF OUTSIDE TRAINING PROVIDERS**

There are benefits to having an outside training provider involved with your

program. We are creatures of habit and we develop distinct habits, good and bad, over the years. By incorporating and infusing new and different ideas and pushing our goals we are able to grow and advance.

Some training providers are adept at identifying program strengths as well as areas to improve. This can be valuable when seeking a challenge for seasoned responders. This is also of value when developing more complex programs that require using your resources, appliances and apparatus to their fullest capacity. Instruction-driven training is much more effective and desirable than the outcome of a response-driven incident.

Outside training providers also may be able to introduce new methods for using your present equipment. Without a doubt, training with the equipment you actually use is a benefit of in-house programs. You may learn a new way of using the tools you have, and you may also recognize deficiencies in your inventories.

Training providers also can introduce new equipment and suppliers to your organization, and equipment and product suppliers can be a valuable training

**By Mitchell Baclawski,  
Assistant Director for  
Off-Site and Consulting  
Services, University of  
Nevada, Reno Fire  
Science Academy**

resource. Some of these suppliers may work with training providers who can introduce new and advancing technologies to your group. Some training providers may also have fixed facilities where suppliers test and evaluate their products. This can be an excellent opportunity for response organizations to give their input into refining current appliances as well as emerging technologies.

A few large, institutional training providers offer programs and consulting to sanction and certify existing in-house programs. These providers examine a company's goals, existing training plans and in-house training teams to evaluate their overall training program. The results of this evaluation can form the basis of an organization's new written training plan, which can then be sanctioned, including an implementation strategy and control measures established by the sanctioning institution. Control measures monitor the new written training plan and, along with





*Pic courtesy of Fire Science Academy*

program documentation, validate the in-house program to the institutional standards of the academy or institution. This third-party validation provides different benefits in different locations and may include valuable continuing education units or CEUs granted by the sanctioning university or academy.

#### UNDERSTANDING YOUR CURRENT PROGRAM

To contract effectively with a training provider to augment and complement an in-house training program, it is essential to take the time to understand your training program and then to devise a plan. Are there long term goals;

are there enabling objectives or short-term goals; does your tactical training plan complement these goals; who is currently providing the training and who recognizes these efforts? After you have a breakout of your program place a value on the components identified and prioritize the needs. This work should show which part of the in-house program needs attention.

When investing in a training provider it is important to research potential providers and to determine what services you want them to provide based on your needs. Characteristics in a qualified provider are no different from what you would want in your in-house training

program; look for qualified, certified, experienced and reputable providers.

When you are investing in a training provider ask what particular providers can add to your program. How do they serve your needs? What qualities do they have that complement your in-house program and its goals? If your in-house program only seeks to achieve compliance with required standards and legislation you will probably want a certain kind of provider different from one who provides training to establish the new standard.

Also consider a provider's technical qualifications; never assume and always check. The most personable hazardous materials instructor may not be qualified to assist you in developing an annual training plan. Find the provider with the best ability to meet your needs.

Be sure the provider is staffed to a level that will accomplish your goals. Training is an investment and it is preferable to have a quick return on your training dollars. As you look at your priorities be certain providers can work at your schedule, not theirs.

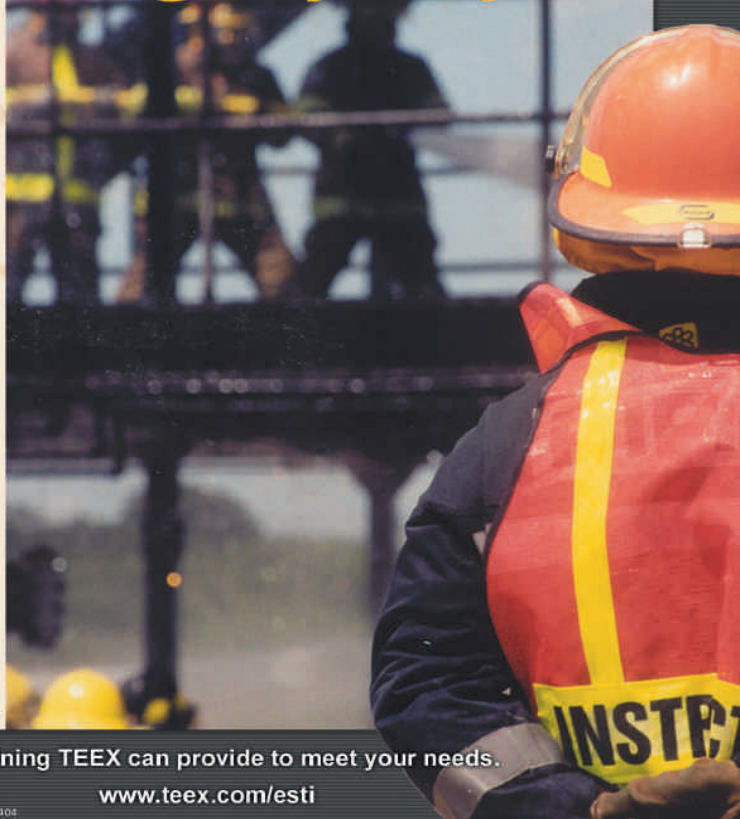
Providers should be accredited or approved to supply the services requested. Check to see whether the provider has certification from recognized boards such as the National Board on Fire Service Professional Qualifications (Pro Board) or International Fire Service Accreditation Congress (IFSAC). Approvals

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may also come from technical committees, advisory or review boards and trade organizations. Also consider whether the programs are in line with accepted consensus standards or practices. Consensus standards are set by many entities. In the United States they are established nationwide and/or statewide by federal and state bodies such as the Occupational Safety and Health Administration (OSHA), the Mine Safety and Health Administration (MSHA), the Federal Aviation Administration (FAA), the U.S. Department of Transportation (USDOT), the National Fire Protection Association (NFPA), and your own state's Fire Marshall. The bottom line is that you work under the scrutiny of outside agencies and regulations and your training provider should too.

Take the time to ensure your training provider is reputable. You can start by asking the provider for references and recommendations from others. A little serious checking on your part should quickly give a fair indication. Is this provider highly regarded by, well thought of and in good standing with others within the field? Have words such as trustworthy, sound, honest and reliable been used to describe the provider? No doubt you have found that emergency services are usually a tight-knit group, and word-of-mouth references are often available.

## SUMMARY

In-house training programs represent the largest number of student contact hours in emergency response training. At times these training hours may not be invested to their full potential. Outside training providers can often increase the value of this investment. Training providers can be a benefit by assisting in the evaluation of your current in-house program and providing services that advance that program. There is a risk from not carefully choosing the outside provider right for your needs. The risk can be minimized by:

- Fully understanding your current training goals and plan
- Defining and prioritizing your needs
- Researching and reviewing provider qualifications
- Evaluating the provider's staffing levels and availabilities
- Checking for third-party accreditation and approvals
- Conducting thorough reference checks

By following these steps, defining your needs effectively and investing the time and resources necessary to enhance and maximize your training program, your outside training provider and your in-house training program will most certainly become a great team.



Mitchell Baclawski is the assistant director for off-site and consulting services at the University of Nevada, Reno Fire Science Academy (FSA), which provides training to hundreds of companies and organizations at its state-of-the-art campus in Carlin, Nevada, as well as worldwide. For more information about the FSA, visit: [www.fireacademy.unr.edu](http://www.fireacademy.unr.edu), call 1-800-233-8928 or (775) 754-6003, or email: [mblawski@unr.edu](mailto:mblawski@unr.edu)

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Acknowledged as the mother of all portable inflatable decontamination showers Professional Protection Systems' DPI (decontamination portable inflatable) unit has undergone its first extensive redesign since its introduction in 1996 revolutionised the decontamination shower scene.

Since then derivatives of this PPS unit have become, amongst other things, the standard decon shower for the NHS, Hospital Trusts and ambulance services in the UK as well as the decontamination mainstay of emergency services throughout every continent. Highly effective, relatively low cost to purchase and operate, easy to

transport and quick and easy to deploy, these are all factors that made the original DPI a classic.

They still apply to the redesigned DPI, but it is slightly larger. The inflatable supporting pillars and cross sections are also more robust giving the whole unit additional rigidity. The new DPI also incorporates raised flooring. Made from recycled plastics this keeps contaminant away from legs and feet. The new unit has also been designed to take practically all of the vast range of accessories that PPS offered to accompany the original model without any conversions being necessary. The idea is that customers switching from old style DPI to new style don't incur unnecessary extra costs.

According to PPS Managing Director Mark Whitcher the scope, quality and size of the accompanying accessory range is almost as important as the basic unit. "It's the accessory range", he says, "that enable us to customise every unit and the fact that we can produce something to the customer's precise specification is one of the main reasons for the continued success of the DPI concept, especially in overseas markets". Just how far this process has come since 1996 can be judged from the fact that whilst the original DPI had no accessories the most basic unit now can easily have 17 or 18. This is the result says Whitcher not of commercial pressure but of emergency planning procedures being constantly rehearsed, reviewed and updated on both a micro and macro level.

**For more information, please contact:**  
**Professional Protection Systems**  
Tel: 01908 272240  
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## INTRODUCING THE SOME OF LATEST TECHNOLOGICAL DEVELOPMENTS IN THE WORLD OF THERMAL IMAGING, ARGUS®3 HOSTS A RANGE OF NEW FEATURES

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*New:* Thermal images are displayed on a 4-inch full colour LCD display. Sixteen colour settings allow the user to set their own preference.

Argus®3 is a camera of choice as a firefighting and rescue tool. In addition to the features above, it also offers as standard: x2 digital zoom (for clearer scene assessment), ambient temperature measurement and on-screen graphics including time/date, battery status, transmitter status/channel, and camera condition. Company logos can also be uploaded for improved asset tracking.

Argus®3 features also include:

- Spot temperature measurement: This enables customers to identify and measure heat source temperature, so aiding assessment of the fire scene.
- Telemetry: Transmitter and receiver modules enable live video to be viewed remotely. Argus®3 – allowing better control of operations.

Andre Goodson, Business Sector Manager at e2v technologies, is confident that Argus®3 is a technological step forward: "We have been working closely with our customers to develop a thermal imaging camera to meet their demanding professional needs. Many unique features have been incorporated into the new camera, for example image capture, giving firefighters new capabilities at the scene of a fire. Argus®3 is a high technology solution to assist the firefighters to carry out their job as safely as possible, at an affordable price."

Supplied with remote control for set-up, side straps, rigid handles, neck strap, end-user software, rechargeable battery packs and waterproof carry case, Argus®3 is a complete product package centred on a unique design philosophy. Building on the achievements of its predecessors and incorporating significant user input, e2v technologies' Argus®3 is setting high standards for performance, flexibility and ergonomic design.

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**For more information, please contact:**  
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Tel: 01245 453466  
Fax: 01245 453725  
Website: [www.argusdirect.com](http://www.argusdirect.com)

## BUCKINGHAMSHIRE FIRE SERVICE GET SMART



Buckinghamshire Fire and Rescue Service have invested in a SMART Board™ for Flat-Panel Displays interactive overlay in their Incident Command Unit.

Damian Smith, Chief Fire Officer explains "our objective was to achieve the most efficient way of managing major incidents from our

command vehicle. We wanted a pictorial representation of the incident ground that everyone in the vehicle could see. From this we have been able to efficiently run briefings and debriefings. Because all the actions and information are recorded and stored throughout the incident, the data is immediately at hand for debriefing.

Stacey Cady of SICA Solutions, suppliers and implementers of the SMART Board commented, "The use of the SMART Boards by Buckinghamshire adds to the growing list of Fire Services using the technology for command and control, briefings and training."

**For more information, please contact:**  
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Tel: 0208 2132169  
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# Product Update • Product Update • Product Update

Fortunately, most Industrial Fire responders may never see a fire in their career.

Unfortunately, this means that all too often brigade members – and even leadership – may be overwhelmed by the magnitude of a fire related emergency within their facility.

A flammable liquid fire that is overcoming the integrity of a storage tank may be impinging an adjacent tank while also threatening a bank of LPG storage bullets nearby. This scenario can – and has – lead to a domino effect of fires and explosions that can easily distract and destroy the best laid response plans if they are not rehearsed and executed with precise and uninterrupted teamwork.

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Each year this wealth of knowledge and experience is shared in a unique training experience staged in Beaumont, Texas. Fire Professionals travel from all continents and dozens of countries to attend this “XTREME Industrial Fire & Hazard Training.”

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- Fire Ground Hydraulic & Proportioning
- Preparing & Managing Resources For Storage Tank Fires – API RP 2021
- Dry Chemical
- Specialized Logistics Control
- Technical Foam Chemistry

- Flammable Liquid Chemistry
- Three-Dimensional Fires
- Large Volume Water/Supply
- Industrial Fire Apparatus
- Fixed Systems
- Process Firefighting
- Handling a Sunken Roof
- Hazard Pre-Planning / Industrial Firefighting Preplanning

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**For more information or to REGISTER, contact Brent Gaspard at:**

**U.S. (225) 673-1999**

**E-mail: [spard@creativeresource.org](mailto:spard@creativeresource.org)**

**Website: [www.williamsfire.com](http://www.williamsfire.com)**

## NIGEL STOCKWELL



It is with deepest regret that we have to announce the unexpected death of **Nigel Stockwell**, Managing Director of Cranford Controls Ltd. He passed away on Tuesday 4th January 2005 whilst on holiday with his family.

He was extremely proud of Cranford's achievements and especially the team of people that helped him

accomplish such a successful company.

The Directors and staff at Cranford will ensure the company continues to go from strength to strength, as Nigel would have wished.

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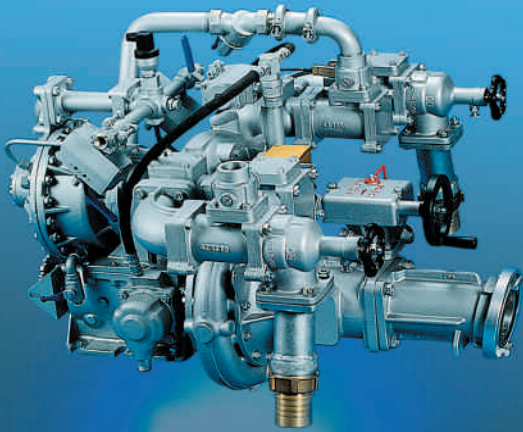
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## COMMENT

Welcome to Issue 6 of International Fire Fighter (IFF) Magazine. I have just returned from the FDIC show in Indianapolis where the last issue was on display. It was with great delight that numerous people stopped by our booth and commented on how they enjoyed reading IFF and were very complimentary about the quality of the articles and authors. Thank you to all who have contributed to making IFF a success. I was also delighted to hear that the FDIC attracted over 25,000 visitors which proves that fire safety is still a top priority for us all. Well done Pennwell for once again, putting on a good show.

I would now imagine that a lot of you are preparing for another big event this year, Interschutz. The show dates are the 6th June to 11th June in Hannover, Germany. This issue of IFF will be on our booth and you can find me and the magazine in hall 12 stand C60/1, if you have the time and can find us through the maze of halls and exhibitors, please do stop by for a chat. I shall look forward to meeting you. In the meantime, if any of you have any ideas about future articles or items you would like to see covered in forthcoming issues, please do not hesitate to contact me.

Mark Bathard  
Sales and Editorial Manager



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WHAT DOES A FIREFIGHTER look for when assessing a helmet? Protection against flames and falling debris, a good fit and clear vision? In a world where firefighters can be faced with terrorist attacks, natural disasters and environmental catastrophes, a helmet should include each of these features, plus a whole lot more.

requirements of a host of performance tests. These include compulsory approvals such as the mask and helmet combination in accordance with vfdb 0802, attachment A and SOLAS as well as, the flame engulfment test required by EN137:2001, Nordtest, EMAP and BUK.

Exposure to high temperatures, flash-over, long operating periods and a multitude of unknown conditions can make firefighting both dangerous and difficult. No matter how varied the tasks and diverse the individual's requirements may be, however, the helmet and accessories should offer maximum protection and freedom of movement in every situation. This calls for a modular approach that should combine safety, comfort and flexibility with national and international approvals as well as meeting the

ensure no penetration of the helmet shell, be resistant to chemicals and humidity and protect against darting flames, sparks and splints. There is also nothing worse than a helmet that is heavy to wear – it will interfere with balance and increase stress. The materials used in its design should, therefore, be light as well as effective.

The centrepiece of any HPS is obviously the helmet shell. This should be durable and able to withstand the most intense heat. As a result of extensive user research, for example, Draeger offers a helmet shell made of glass-fibre reinforced Duroplast which retains its shape and protection levels, even when exposed to flashover, and which meets the requirements of radiant heat tests EN 443, 14kW/m<sup>2</sup>. The inclusion of fibre glass ensures good penetration resistance and can also resist low temperatures down to -40°C.

With a self-extinguishing lacquer structure, it also protects against the impact of extreme heat. This is particularly important when considering that, in routine tasks, firefighters can work in air temperatures of up to 55°C. In hazardous situations these temperatures can rise to 300°C and, in emergency

**INTERNATIONAL FIRE FIGHTER**



# Helmets

## – offering far more than head protection

situations can reach a breathtaking 900°C; that's 200°C higher than the melting point of aluminium, a material that is sometimes still used in helmet construction.

Conforming to DIN EN 443, Duroplast offers a host of benefits to the modern firefighter. As well as being temperature, shock and penetration resistant, even at high temperatures, it minimises heat radiation into the interior and, as a result, improves comfort levels beyond the norm. In the event of sudden, uncontrolled cooling, the outer shell will not soften and it offers acid as well as fluid metal resistance. Robust yet lightweight, Duroplast also offers good electrical isolation and excellent longevity.

The inner lining of a helmet can help to determine both its' comfort and fit. Some lining materials are made of high quality Nomex which covers a large portion of the head. They can also include a Nomex hairnet to significantly reduce heat levels, a washable headband and a flame-retardant chinstrap which, if fitted at three points as in the case of the Draeger HPS6100, will prevent slipping and chaffing. Buckles made of temperature resistant plastics have obvious benefits, as do different types of neck protectors.

Ideally, neck protectors should be interchangeable for different applications. Many different designs are available and include a Nomex neck curtain to protect the back and side of the neck from heat, an aluminium version to protect against moisture and provide reflective properties as well as good ventilation, a cracked leather, water repellent design, or the Nomex Dutch scarf. Made out of 100% flame retardant impregnated wool, This circumferential wool neck curtain is also oil and water repellent.

A secure chinstrap, such as the three-point design, will also help to ensure that the helmet remains in place despite forces from different directions. In addition, it allows the helmet to be easily and quickly adjusted to suit the wearer and the circumstance. Recognising the importance of a good fit and as part of its tailor-made solution, Draeger not only offers a range of deep-fitting helmet sizes from 52-64 but has introduced an extra pad that can be used to reduce the size to 50/51. Coupled with the adjustable head, neck and chin straps, this ensures a comfortable secure fit during any manoeuvre.

A range of optional visors will also further augment firefighter safety. Clear polycarbonate visors that are scratch resistant on both the inner and outer faces will fulfil high mechanical and optical protection requirements, including Ballistic protection B, and allow safe and pollution free work when endangered by flying particles. Anti-



Pic: Courtesy of Draeger Safety

scratch, gold-coated visors can also be used to protect against infrared radiation. A metal mesh visor, usually made out of aluminium because of its' good conduction properties, can also be used to protect the face mask visor under intense heat.

Different coloured helmets are available for different firefighting forces and ranks and can also be supplied with a separate front plate with a generous area for individual labelling/markings. Flame-resistant reflective stripes can also be applied to ensure fast location and easy identification. Lamps and light adaptors can also be easily fitted to improve visibility or, in the worst case, to assist in search and rescue operations.

In addition to good spatial awareness, hearing and acoustic perception is also paramount. A helmet shell that is more open to the front and which "flares" out at the base will improve directional hearing and allow a phone to be used underneath.

Other forms of communication can also be integrated to meet the needs of every assignment or task. These range from practical, noise sensitive bone-conduction microphones with one or two speakers, and air conduction microphones that are integrated in the speaker unit, through to throat microphone/speaker combinations for use in loud environments. Particularly suited to rescue operations, for example, the Draeger MP-H Com is a very versatile helmet unit with gooseneck microphone that can be quickly and easily adapted to a wide variety of helmet designs.

Head protection systems that have been designed with the user in mind should not be detrimental to the use of other protective equipment, such as breathing apparatus. The patented Draeger Supra-Adaptor for instance, allows easy connection of the face mask to the HPS 6100 Helmet and can be easily readjusted to fit other head harnesses if required.

Further information is available from Richard Beckwith, Draeger Safety UK Limited, Ullswater Close, Kitty Brewster Ind Est., Blyth, Northumberland, NE24 4RG. Tel: 01670 352891. Fax: 01670 356266

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# Professionals need professi

TODAY, MODERN FOOTWEAR SYSTEMS are able to offer more than only protection to the foot by means of a steel toe cap and a steel midsole. High-performance functional footwear should be adjusted to the wearer's tasks and the associated occupational hazards.

A balanced foot climate does play here a very important role. Especially anatomical points of view are not considered in a norm but are very important to avoid long-term damages to the human body as far it it

is technically possible.

Good functional professional footwear should therefore not only protect from incoming moisture but also have systems which absorb foot perspiration during the daily usage and

transport the occurring foot perspiration outside by means of membrane and conditioning systems.

To reduce the daily pressure which effects the feet by body weight and equipment, the footwear should be designed in a way that the weight is absorbed during treading and the arising energy is converted into kinetic energy. The right outsole does play a special role here. It has to support reproducing the natural rolling movement of the human foot, work anti-skid and have features that ease the wearer's tasks. For this, foot and boot has to unite. The choice of the correct shoe size and the anatomic shape forming of the inner shoe have a particular importance.



## MELBAMAX



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A **penetration proof insole** worked into the sole protects the wearer from hurtful impacts from below. The sole distinguishes by a **marked heel front**, is **oil and fuel resistant** and **non-marking**

# onal footwear



This firefighting boot meets even the hardest requirements. For optimal comfort, this boot is equipped with the **HAIX®-MSL-System**. By injecting PU foam it is attained that the boot is waterproof, that the foot is cushioned from heel to ball during going and standing, and that upper, insole and outsole are connected durably. This high-tech functional boot is equipped with **waterproof leather** and the **GORE-TEX® membrane**, the **HAIX®-Climate-System** and a **rubber toe cap**. It is antistatic according to **DIN EN 344/345**. With its rubber outsole having a marked tread, it is solid when standing, in the country, when standing on ladders, and it is extremely nonskid

If the inner side of the shoe corresponds to the anatomical form of the human heel as far as possible, foot and boot can unite. The shoe becomes then the flexible foundation of the human body. It protects him, eases his tasks and avoids, as far as possible, long-term health damages.

To guarantee all these characteristics during the whole lifespan of the boot, it is an important precondition to select quality materials. Here, the correct choice of leather and its processing is decisive. Only leathers that are worked to keep their shape for a long period of time, can base and support the foot. This of course affects the price.

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# An Evolution in gloves

BEFORE HISTORY WAS WRITTEN, the cave man of the Stone Age used gloves.... Not merely a mitten but a glove with fingers and a gauntlet covering his forearm.

Thousands of years before the Scottish proverb, 'Touch not a cat without a glove', primitive man had realised the necessity of shielding his hand, when only a sharpened flint was his weapon for hunting for food, with bears or wolves.

**B**ut for that glove, claws could have slashed open a forearm or fangs snapped fingers and left him defenceless.

From the very beginning of things, man has always carried his life literally in his hands. Hence gloves, as essential to man the hunter as today to the electrician, handling high voltage cables, the policeman in dealing with the public and our fire fighter in fighting fires.

Fire fighters face many different hazards as part of their daily work, especially the risk of scolds and burns, a fire fighter also has to contend with the possibility of contact with solvents or other chemicals as well as sharp or abrasive objects.

Fire-fighters clothing and in particular gloves, therefore has to provide protection against a wide variety of hazards, in addition they must allow the wearer sufficient dexterity to operate all the complex and finite equipment they use in today's modern fire service.

The fire-fighters glove standard EN659 was first published in 1996 and provided minimum requirements of protection for fire-fighters gloves; historically, most fire brigades in the UK had purchased gloves to a NFPA specification, the ideology of the American gloves had been the thicker and harder they are, the more protection the gloves will offer to the hands, the new European standard challenged this.

There are three levels of protection applicable to an EN standard.

- 1 Simple Design**
- 2 Intermediate design**
- 3 Complex design**

Fire-fighting gloves incorporate the highest level – 3, complex design.

All of the materials used in the glove, plus the actual design and structure are tested by an independent laboratory, to the relevant individual EN or BSI standards, which constitute the EN659 standard.

The manufacturing of complex design products must also be certified to an approved Quality Management System.

A revised version of this standard has now been accepted EN659:2003 and this includes a number of alterations and additional tests to take into account areas that were not previously covered by the 1996 document.

In some areas, the minimum performance levels have been increased or the methods used changed to take into account current thinking.

The areas where performance levels have been increased are the abrasion, tear and puncture requirements from EN388.

This offers a more robust and durable glove, offering greater levels of mechanical protection.

The method given for radiant heat has been changed. The new methods given in ISO 6942, which is intended to supersede EN366, utilised a heat flux density of 40k/m<sup>2</sup> is used.

A requirement for the contact heat of a glove when tested wet has been included. This test takes into account the potential risk of steam burns or scalds where moisture build-up on the

inside of the glove is driven to steam through external contact of the glove with hot objects.

One significant area which was not covered by the original version of EN659 is the potential of contact with liquid chemicals. Fire fighters often find themselves in situations where accidental contact with a liquid chemical can occur.

It is not always possible to avoid contact; the fire-fighters gloves must therefore prevent small quantities of chemicals coming into contact with the skin.

The EN368 test method is used to assess the glove against a range of chemicals, 30% sulphuric acid, 40% sodium hydroxide, 36% hydrochloric acid and heptane, have been chosen to represent the most common types of chemicals that are likely to be encountered.

Taking all of the situations and hazards a fire fighter may encounter, it is therefore vital that the hands are given the amount of protection they need and deserve!

The design of a glove is most important, first and foremost it must meet the essential requirements for the wearer, i.e. 'fit for purpose'.

To ensure the best protection, the outer shell of the glove has to have a good quality grain leather.

- 1 Pig leather** – smooth and firm, recognised by hair holes in the skin – used for cheaper leather gloves.
- 2 Goat leather** – strong leather more suitable for basic working gloves.
- 3 Cowhide leather** – very tough, very strong and supple, ideal for fire gloves.

The characteristics of these skins will vary accordingly to the part of the world the animal lives; in general the temperate zones of the world provide the best environment for growth and development of livestock.

The less favourable the climate and the more primitive the animal husbandry, the poorer the general condition of the animals and the lower the potential leather making qualities of their hides and skins.

The term 'hide' describes the outer covering of large animals, i.e. cattle, while 'skin' refers to small animals, e.g. sheep, goats and pigs.

Prior to the leather being suitable for making into fire gloves, there are a number of processes the skins must go through.

The raw hides must be preserved to



Pic: Courtesy of Southcombe Brothers



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# An Evolution in gloves

stop deterioration, especially during transportation.

The hides are then fleshed to remove the fleshy tissue on the inside, depending on the thickness of the hide this can then be split into 2, 3 or 4 individual skins, however, the 1st quality leather will be the top grain side, the number 2 or 3 split in the hide will only result in an absorbent suede leather, with no tensile strength, mainly used for cheaper glove styles of fire gloves.

Solvents in the dye vats reduce the grease level to 5%, which is acceptable for dyeing.

Tanning converts the raw skin into a stable material, which will not putrefy; this is done with minerals such as chromium, aluminium and zirconium.

Shaving the leather is done to achieve a uniform thickness for fire glove leather; this is usually 1.1mm, to give adequate protection from the leather and also the dexterity when on the hand.

The final wet process is for the hide to be dyed, this can be either surface dyed – for cost cutting, or complete penetration, fat liquors and chemicals are also applied in this process to give flexibility and softness.

The first line of defence in a fire-fighting glove is the outer shell, so the need for a good quality protective leather is the most important requirement.

There are two basic designs for a fire fighters glove, they can use either a Gunn cut design or a Fully Fitted design.

The Gunn cut design is a cheaper manufacturing option, having only one leather centre piece to fit the sides of the two middle fingers, thus having less seams, however, the Fully Fitted cut design incorporates a separate piece of leather cut for each side of the fingers, thus using more leather, more stitch seams but offering a better fit, with more dexterity.

The actual cutting of the leather into the hand shapes is so important. The skilled cutter must first ensure that the hide is free from faults and scars, plus he must ensure through stretching the leather that it has 'run', meaning that the leather is not restrictive when the hand closes into a fist shape.

However, for the length of the glove, the stretch in the leather has to be restrictive, you do not want the finger lengths to grow longer and longer the more times they are pulled on and off the hand.

The separate leather pieces, (in some

cases the number can be 9), are now ready to be sewn together, to form the outer shell. There are various stitch types that can be used, i.e. pique, kipseam, prixseam, or brosser.

Brosser, this type of stitch is where the sewing machine takes a stitch over the edge of the leather and is picked up by the needle which takes another stitch through the edges of the leather. This produces a very fine close seam and is



*Pic: Courtesy of Southcombe Brothers*

used for light-weight leather gloves – not suitable for working gloves, where the stitching would come under considerable stresses, being on the outside of the glove.

However, the majority of fire fighting gloves are sewn together with the stitch type being prixseam inseam, this produces a neat, strong lock stitch, sewn on the inside pieces of the glove, therefore tensioning is important to prevent 'grinning' on the seam joints, especially at the top of the fingers, when the glove is turned after making.

In a multiple three-layer glove, the combination of the moisture barrier and the inner lining is also important in supporting the protection given by the leather shell and must be securely stitched into the tops of the fingers to ensure 100% lining retention.

The range of materials available to glove makers has undergone a revolution in the last decade.

Whilst the more traditional materials, such as cotton or nylon and pile fabrics

still have a role to play, the age of the performance fabric is now with us.

Fabrics or yarns are now available which transport and manage moisture, thermoregulate, stretch for comfort, prevent the passage of blood borne pathogens and even inhibit the growth of bacteria. Ideally for the fire fighting gloves you need a material from aramid fibres to offer protection for the hand against thermal and mechanical hazards.

Although the EN659:2003 still has not a requirement in the standard for a waterproof membrane, a good quality fire fighting glove will incorporate a membrane and particularly one that is resistant to blood borne pathogen fluids.

Gore's 'state of the art' Crosstech moisture barrier has been qualified under the NFPA Standard 1971(1997 edition).

Gloves incorporating Crosstech moisture barrier are tested to ensure it is liquid blood, body fluid and common chemical liquid penetration resistant. In addition, these gloves will be waterproof and provide the highest level of performance, durability and breathability.

What typically helps in heat protection detracts from wearer comfort, particularly in such a small refined area as the hands. Thick insulation/lining reduces breathability and restricts freedom of movement; therefore, the essential element in the design of a protective glove is to make the assembly as light and dextrous as possible, whilst maintaining the highest level of protection.

Today's modern fire fighter has never been so well protected from all of the complex hazards they may encounter during their duties. 'Too well protected' has been the comments, making the fire fighter feel immune to the dangers whilst in a fire situation, however, research and development will continue to improve the existing products.

## Malcolm Hannon

Sales Director

### Southcombe Brothers Ltd.

Malcolm has been in the glove industry for 20 years, 2 years as general manager of Sudbury Gloves and 18 years at Southcombe Brothers, where in 1995 he helped to develop the Firemaster glove range.

Prior to this, he was a dyer and finisher with Courtaulds and British Vita.

He is an executive member of the British Glove Association and is one of the judges for the yearly exhibition of university student glove designs.

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# Counter Terrorism and resilience



Pic: Courtesy of Grindex

EVER SINCE 9/11, the Government has made it a priority to be open and honest with the public about the level and nature of the threat we face. Through new websites, publications, speeches and Parliamentary updates, Ministers have ensured that the amount of information on security matters that is publicly available has increased.

This must be done in a way that does not compromise security or unnecessarily raise fears. It is important that the public knows what basic self-protection steps to take, and understand the work going on behind the scenes to protect us all.

Government departments and the police continue to work together to develop further public information to help people maintain vigilance and prepare for the consequences of serious incidents.

A public information booklet, *Preparing for Emergencies – what you need to know*, has been delivered to 25 million households in the UK. It contains practical advice on how to prepare for a range of emergencies.

## THE GOVERNMENT'S RESILIENCE AGENDA

### Key messages

- The UK's resilience to disruptive challenges is already high. There is a strong tradition of effective planning

and response at the local level. And 30 years of terrorism has established a capability within Government and an awareness amongst businesses and the public which puts the UK in a comparatively strong position.

- Nevertheless, the Government is not complacent. The flooding and fuel crises in 2000, and the Foot and Mouth outbreak in 2001, exposed weaknesses. We have learned the lessons of these challenges.
- So the Government is seeking to improve the UK's resilience to disruptive challenge. This means both reducing our susceptibility to challenges by reducing the probability of their occurrence and their likely effects; and responding quickly and







effectively if and when they do occur.

- This work has a number of different strands:
  - **Horizon-scanning** activity to identify and assess potential and imminent disruptive challenges to the UK and assist in the development of an integrated response.
  - Increased investment in the capabilities that underpin the response to emergencies.
  - An enhanced counter-terrorism framework, including investment in operational activity and new legislative measures.
  - An emphasis across government on improved business continuity arrangements.
  - The Civil Contingencies Bill, which will create a civil protection framework to meet the challenges of the 21st Century.

#### CBRN – TOP LINES

#### What is the threat from CBRN terrorism?

- The discovery in January 2003 of paraphernalia that could be used in the production of dangerous substances shows there is a continuing interest in using chemical, biological

or radiological agents as weapons of terror.

- The Home Secretary will continue to keep under close review any threats to national security. If a specific credible threat becomes apparent the Government and the appropriate authorities will, without hesitation,



inform the public of what action to take. At the moment, we ask everyone to be vigilant and report any suspicious activity to the Police.

#### Chemical Threat

- Dangerous substances are strictly controlled by a number of instruments. It is a criminal offence not only to possess chemical weapons but also to provide, receive or recruit for training in the use of such weapons.
- A detailed assessment of potential chemical threats has been made. Where antidotes to these chemicals are available, they have been stockpiled.
- Detailed medical advice has been provided to medical practitioners on the HPA website.

#### CBRN Cross Government Co-ordination of Preparations

- The Home Secretary chairs the key Cabinet Committees; DOP(IT)(T) which oversees the work to strengthen the UK's defences; DOP(IT)(R) which works to build the UK's resilience and ability to manage the consequences of major emergencies; and the Civil Contingencies Committee which meets in times of crisis to manage the response and is



attended by representatives of the relevant emergency services and agencies. The Devolved administrations are also involved in these committees.

### **'Dirty Bombs' or Improvised Nuclear Devices**

- At a national level, existing contingency plans for dealing with the aftermath of radiological emergencies arising from nuclear and other incidents have been reviewed and adapted to cater for the deliberate release of radioactivity into the environment ('dirty bombs'). DEFRA takes the lead in maintaining these plans.
- The National Radiological Protection Board (NRPB) and other bodies with specialist capabilities would co-ordinate the monitoring of radiation levels following the initial emergency phase after a dirty bomb. NRPB and other parts of the Health Protection Agency would provide expert advice to the Government, Emergency Services and local government dealing with an incident involving radioactive materials. Once the emergency phase of an incident has come to an end and the emphasis has shifted to recovery including environmental clean-up, the lead in co-ordinating the longer-term response would pass to DEFRA.
- The NHS has detailed guidance and well-rehearsed plans for a nuclear or radiological emergency.

*The National Radiological Protection Board (NRPB) and other bodies with specialist capabilities would co-ordinate the monitoring of radiation levels following the initial emergency phase after a dirty bomb.*



*Pic: Courtesy of Grindex*

### **Emergency Services Preparations for a CBRN Incident**

- The emergency services have equipment and trained officers to enable them to respond to a release of CBRN material.

- All three emergency services have officers equipped and trained in the use of personal protective equipment suits (PPE). These suits allow them to attend an incident where there has been a release of CBRN material and to proceed to carry out their jobs.







*Since late 2002, senior ambulance staff have been participating in Joint emergency Service CBRN Incident Commander Courses. All ambulance services in the UK are now fully trained.*

#### WHAT HAS THE UK DONE SINCE 9/11 TO MAKE THE UK SAFER?

##### EMERGENCY SERVICES AND CBRN

- Every acute hospital and ambulance service now has a stock of personal protective suits, and is equipped with mobile decontamination units, to allow safe working and decontamination of patients.
- Some 3,200 protective suits were provided for hospitals and 4,300 for the ambulance service. Of the 360 mobile decontamination units procured, 200 have gone to hospitals and 160 to the ambulance service. These units offer shelter, power and water management systems to NHS personnel who are decontaminating patients.
- In addition, a central stockpile of protective suits has been established and agreement reached with the Fire Service for support in the event of a need for mass decontamination.
- Since late 2002, senior ambulance staff have been participating in Joint Emergency Service CBRN Incident Commander Courses. All ambulance services in the UK are now fully trained.
- A cadre of instructors has also been trained to enable the local training of decontamination teams. Courses are being held regionally and about 180 trainers have successfully completed it to date. By early summer this figure will have increased to around 300.
- Considerable investment has been made across Government in providing equipment for the emergency services and will continue to be made in areas such as developing the urban search and rescue capability within the Fire Service, and improving first responders' ability to detect and monitor CBRN substances.
- The Office of Government Commerce now has a dedicated CBRN procurement team in place to ensure economies of scale, assist with equipment interoperability issues, and streamline procedures for our partners and contractors.





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# Perspective on the Paris Hotel Fire

ONCE AN INDIVIDUAL HAS become proficient as an engineer or technologist, he or she will start to develop an awareness of the political and social side to his or her profession. Such awareness is required in a high degree by those who, as their careers develop, choose to move away from practicing their professions in the conventional sense to planning and policymaking.

By J.C. Jones  
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University of Aberdeen  
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Any profession, for example medicine, exists in order to serve and protect society. It does this partly by routine application of what is already known and partly by developing its knowledge base so as meet the needs of changing times and circumstances. In the UK and other 'developed countries' standards of nutrition and hygiene are high. By ensuring this 'society' helps the medical profession to fulfil its role in maintaining a healthy population, so the relationship between society and the profession is two-directional to the benefit of each. This would not be so in a country with poor standards of public health where most of the effort of medical professionals had to be focused on contingencies which would not have occurred if society had been playing its part in looking after the physical well-being of its members.

This argument relating to medicine can also be applied to fire protection engineering. Fire protection engineers in a well ordered society can be confident that measures are in place to prevent

fires and that trained personnel are able to respond rapidly when a fire does occur. They can also be confident that at places where people assemble on any scale – from a family home to an airport terminal – there is adequate provision for evacuation. 'Fire codes' and the like are used in design and construction to these ends and these originate from expertly conducted investigative work, the analogue of 'medical research' in our discussion in the previous paragraph. The responsibility of society, in the form of its legislature, is to ensure that its members benefit from advances in fire protection engineering.

All of this has been broadly based, there being no mention as yet of the recent fire in Paris which claimed 23 lives. A detailed discussion on the events of the fire is not possible partly because the author does not have any information which is not accessible freely through the Web and other sources and also because such a commentary might not be appropriate when the matter is *sub judice*. It is however both possible

and legitimate to make some comments on the fire against a background of what has been said above about the responsibilities of the fire protection profession and the community to each other. Accounts of the Paris fire contain one dismal fact after another. According to what I have read the hotel had six storeys yet only one staircase. Many of the occupants were illegal migrants lacking formal documentation establishing their identities. Adding to the intrinsic vulnerability of the building was a wild party held within it at which alcohol and drugs abounded and candles were lit. It appears that contact of the candles with a flammable fabric is what started the fire.

The present author has no comments whatsoever to make on the issues of illegal migrants, alcohol or drugs: such matters *per se* are outside the scope not only of the article but of this periodical. What he does want to do by way of conclusion is remind a reader of the point made previously that a profession will serve society effectively only when there is mutual exchange and interaction and to add that the Paris fire was clearly a situation in which the fire protection profession could not have done any better because society's duties to it were not being fulfilled.

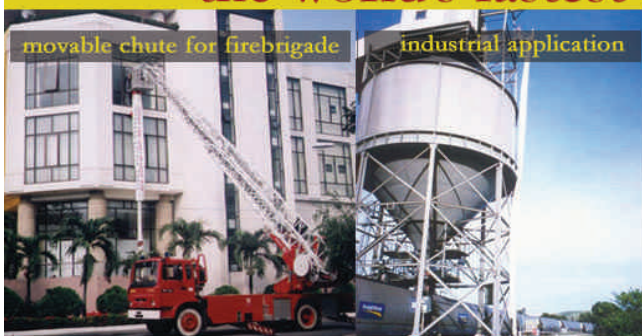
*Fire protection engineers in a well ordered society can be confident that measures are in place to prevent fires and that trained personnel are able to respond rapidly when a fire does occur.*

Though the hotel in which the fire occurred was allegedly a pretty seamy place there is apparently an expensive and prestigious building very close to it. It is fair to suggest that 'state-of-the-art' fire protection facilities were in operation there. The contrast is disturbing.

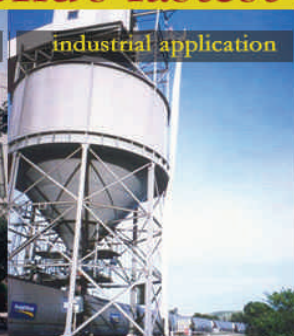
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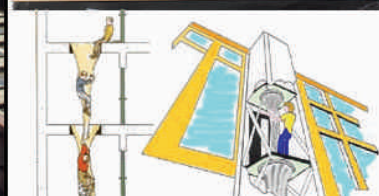
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No one knows when or what the next fire or disaster may bring. But with bigger, more complex situations, high-rise buildings, and threats of terrorism, fires will only continue to burn hotter and become more challenging to control.

Prepare yourself for battle with the best defense available — PBI Gold. No other outershell can offer a more complete protection solution for the fires you can expect today and will eventually face tomorrow.

## More Brigades turning to PBI Gold

PBI Gold has become the most widely used choice for outershell protection in the United Kingdom and is rapidly becoming the outershell fabric of choice around the world.

From North America and Great Britain and throughout Europe, to China, New Zealand and Australia, PBI Gold is the global choice of Fire Brigades that regard firefighter safety as their top priority.

According to Walt Lehmann, Global Marketing Director for PBI Products, "brigades throughout the world are conducting their own independent testing and are choosing PBI Gold for one basic reason . . . it provides their firefighters with maximum protection. We've been told by brigade spokesmen that the primary reason for deciding to specify PBI Gold is superior flame and breakopen resistance under extreme flashover conditions," Lehmann said.

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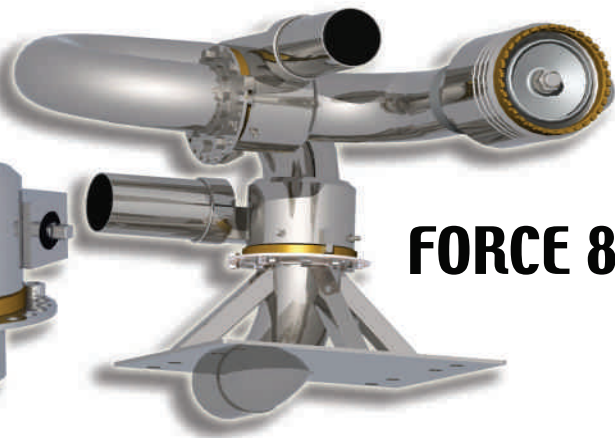
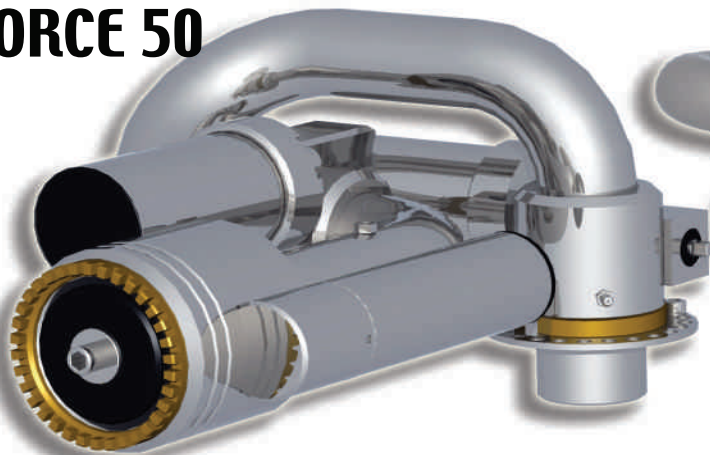
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# Torches and Portable Lighting

## Enlighten your work life

Before Edison's wonderful electric light bulb was invented, if you wanted to illuminate the darkness you had to carry a naked flame with you. Can you say "Fire Hazard"? Fortunately, Hubert Conrad in 1890 invented the battery powered Torch and over the years it has evolved to match the requirements of individual groups of users. The modern torch now provides the user with an array of choices from the type of lamp, shape of the beam, construction materials and approvals for hazardous work environments. The aims of this article are to compare differences between various types of technologies used in modern torches, and discuss this vital tool in the context of workplace safety.

### 'CLASSIC GASES' VS. NEW TECHNOLOGIES

Professional lighting manufacturers have been striving for years to develop the brightest possible torches. They have struggled to produce lamps that not only create impressive amounts of light but also last for a reasonable period of time. The classical Edison Incandescent lamp utilizes a metal filament (usually tungsten) through which current is drawn to heat up the metal and generate light. To prevent the filament from oxidizing, it is suspended in an environment devoid of oxygen. Usually, this environment is achieved by surrounding the filament with a glass envelope and replacing the air inside with either a vacuum or an inert gas. In recent years it is these inert gases, such as Halogen, Krypton and Xenon that have allowed the manufacturers to achieve greater amounts of light output and also allow the filament to burn at higher temperatures. By using these 'classic' gases the results are superior to a simple vacuum lamp as they offer a white collimated beam of light that provides a better tool for professionals such as plant maintenance, fire fighters and law enforcement. In general terms, Halogen and Krypton would be more powerful than Xenon, but this sentence is not always right. It also depends on many other components and the design of the torch. The difference in the whiteness, or color temperature, between torches is due to the type and quantity of gas inside the glass bulb of each torch.

Another important factor in the making of a professional torch is the lamp reflector. The shape and texture of the reflector has a marked effect upon the quality of the beam that is generated by the lamp. Ideally, an efficient reflector should collect all of the light generated by the lamp to create a beam free from shadows and dark rings. Compare the beam quality of high-end products from premium torches manufacturers with cheaper lights and you will see a distinct difference!

The batteries used to power torches have also evolved over the years, with manufacturers striving to provide the maximum amount of energy inside the smallest container. Torch manufacturers want high voltage and amperage-hour capacity in order to create the brightest and longest lasting torches, and the battery manufacturers have answered

the call with new, powerful, primary alkaline and lithium cells, and rechargeable nickel metal hydride (NiMH), sealed lead acid (SLA) and nickel cadmium (nicad) battery packs. With each passing year, the duration of batteries increases while the size of cells shrinks.

Probably the most significant advancement in the field of lighting technology has been the Light Emitting Diode (LED) invented by Nick Holonyak in 1962. This single invention has created a revolution throughout the lighting world. The basic advantages of the LED over Edison's incandescent lamp are greater efficiency of light per watt, lower cost of replacement of the lamp, longer battery life and greater impact resistance. However, due to the relative infancy of the technology, while LED light output is not yet as bright and intense as the current incandescent lamps on the market, millions of Euros are being poured into this area of research to resolve this shortcoming. LED torch manufacturers are currently being challenged to create innovative designs that maximize the output of LEDs, and this is resulting in torches that are not created equal . . . please read on.

The LED produces light by moving electrons through materials to create photons of light. The materials used to create the LED are organized into a "chip" and lie on a flat substrate. In contrast, the classical Edison filament

*The basic advantages of the LED over Edison's incandescent lamp are greater efficiency of light per watt, lower cost of replacement of the lamp, longer battery life and greater impact resistance.*



# Torches and Portable Lighting

*Probably the most important advantage of the low heat an LED produces is that the lamp's life is upwards of 100,000 hours, compared to the 20 to 60 hours of a conventional torch lamp.*

hangs between to poles like a tight rope. By lying on a flat base, the LED is inherently more stable when subjected to an impact, which can literally mean the difference between life and death as we shall see later in the article.

The LED also creates very little heat compared to the filament and this aspect alone leads itself to a safer working environment, especially when used in a volatile atmosphere. This lack of heat means that more energy is converted into photons of light, whereas the filament lamp creates a tremendous amount of heat as the filament burns. This can lead to a surface temperature on the glass envelope in excess of 150°C (300°C) – enough to automatically ignite some volatile gases. Probably the most important advantage of the low heat an LED produces is that the lamp's life is upwards of 100,000 hours, compared to the 20 to 60 hours of a conventional torch lamp. As one can imagine, the combination of low battery consumption and long lamp life lead into a torch that rarely needs replacing. The effects on the environment due to a reduction in battery consumption are to be applauded, as is the reduction in battery replacement costs. However, the incandescent filament still has one significant advantage over the LED and that is the ability to create tremendous amounts of light by increasing the filament size.

One disadvantage of the LED has been the ability to focus the light emitted from the chip. Until recently, the only way that torch manufacturers could create a product that generated a reasonable amount of light was to package together many LEDs into a cluster. This approach created a soft wide beam that was fine for close up work but was not focused enough to throw light over distance or penetrate smoke or fog. This situation changed in 2003 with the advent of a new technology referred to as RECOIL LED

Technology™ from Peli Products. For the first time, an LED could produce the brightness of a classic incandescent lamp but with the longer burn time and lower operating costs of an LED.

This new invention consisted of using one of the new generation of high-wattage LumiLED LEDs from Luxeon and directing the light *back* into a reflector, just like a lighthouse. This simple but innovative method captures nearly 100% of the light emitted by the LED, and then reflects it forward into a truly impressive beam of pure white light. Comparing this approach with a regular 8-LED torch, the resulting Recoil beam is 33 times brighter. With the new generation of Recoil LED lights producing comparable light output to incandescent lamps, yet with significantly lower operating costs, perhaps the “torch” is about to be passed from Edison to Holonyak. . .

## Photo Technology

### COMPARING MANUFACTURER'S TORCHES

In order to compare professional torches, the user should decide which features are most applicable to his work environment. Torches can be compared by reviewing light output characteristics, battery life, manufacturer's guarantees,

lamp replacement costs, price and, most importantly for the health and safety market, hazardous location approvals. With respect to the measuring of the light output, manufacturers use Lumens and Lux. Lumens indicate the total amount of light emitted by the light source, whereas Lux measures the intensity of the beam at a distance – itself a function of the reflector. Choosing carefully which torch would better fit a user's expectations means that several manufacturers' torches should be compared for differences in brightness.

Some users will be concerned about the consumption of batteries and lamps. Probably the most popular reason for a torch being discarded is a burnt out lamp. With a life upwards of 100,000 hours, the LED torch rarely requires replacement. In addition, the low battery consumption of the LED torch will ensure that financial budgets are not eaten up buying batteries. Finally, the decision to purchase an LED light is kinder on the environment, as fewer batteries mean less waste.

Some applications require brightness over all other considerations, and it is here that the incandescent torch reigns. For users requiring highly focused beams, such as firefighters and scuba divers, torches should be examined for beam characteristics and their ability to penetrate the environment in which they are intended to operate.

### PORTABILITY AND USABILITY

By their very nature, all torches are portable. However, market segmentation has forced manufacturers to create lights that match their user's specific requirements, of which portability is an important criteria. Many industrial users of portable lights are increasingly adapting to the hands-free approach of using headlamps and brackets that mount

*For users requiring highly focused beams, such as firefighters and scuba divers, torches should be examined for beam characteristics and their ability to penetrate the environment in which they are intended to operate.*



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# Torches and Portable Lighting

lights onto work helmets. Available in a wide variety of sizes and styles, headlamps and torch helmet brackets allow the user to focus light on a task while allowing them to use both hands rather than hold a torch.

Other users, such as fire fighters, like to attach the light to their equipment so that they can release it without fear of dropping the torch on to the ground. Such users look for torches equipped with rings and clips made from durable stainless steel.

## A TORCH FOR EVERY USER

Depending on many users' requirements, lighting systems can vary a lot. When a torch needs to operate long hours, it is more efficient, in terms of cost, to use a rechargeable system rather than one with an alkaline primary battery. Workers operating in atmospheres with high temperatures should select plastic rather than metal torches, in order to avoid the excessive heating of the torch body. Finally, workers within hazardous locations need to make sure that their torches are safe and correctly certified by Safety Standards such as the ATEX Directive (in Europe).

## SAFETY

Why are torches required to conform to safety standards? Though they seem to be small and innocuous, the lamp and the batteries inside can be a significant source of ignition when used in a hazardous and volatile environment. The lamp filament operates at a very high temperature and some gases will ignite if they come in contact with either the filament or even the glass envelope. The batteries themselves can be a source of ignition, especially if a short circuit occurs resulting in the generation of a spark. Even the body of a plastic flashlight can build up a significant static-electric charge, and some manufacturers metal plate their lights to prevent such build-ups from occurring. Such lights

*Even the body of a plastic flashlight can build up a significant static-electric charge, and some manufacturers metal plate their lights to prevent such build-ups from occurring.*

are typically referred to as "Zone 1/Zone 0" torches.

In order to prevent accidents, lighting systems need to be approved to certain Safety Standards, as mentioned before. There are several of them: Underwriters Laboratory (UL), Factory Mutual (FM), Canadian Standards (CSA), Urban Search and Rescue (USAR), Mine Safety Health Administration (MSHA), Australian Board of Approvals (AUS), etc. Notified bodies certify torches to ensure that they pose no threat of ignition when operating in hazardous locations. The notified bodies test the torches by subjecting them to worst-case scenarios. For example, the spark generated by a short circuit of the batteries is used to see if it will ignite a chamber of gases where the light is expected to operate. Only if the gases fail to ignite will the light be certified for operation within that environment.

## CRITICAL MISSION

It is imperative that a torch used by a professional such as a fire fighter or plant maintenance technician operates reliably in the field. The ramification of a torch lamp failing at the critical moment when a fire fighter enters a burning building needs no explanation. LED technology renders lamp filament failure, which is probably the most common mode of torch lamp failure, a thing

of the past. In addition, the careful measurement of filament and LED temperature ensures that the user knows precisely in which hazardous environments the torch is safe for operation.

## PAY NOW OR PAY LATER

Nowadays one can find many cheap lights available on the market, but quickly after the low price has been forgotten, the true degree of quality will surface. As a manufacturer of professional torches, we recommend users to check the quality of a lighting system before buying it. By quality we mean, in general terms, brightness, tough materials and safety certifications. It is also important to consider the guarantee that the manufacturer offers. The length of that will determine if the torch will stand the test of time and extreme conditions.

Professional, high-performance torches are significantly more expensive than regular incandescent ones. Purchasing agents and individual buyers may not see the rationale in purchasing such expensive lights but over a period of time, the high cost of a professional, ATEX approved torch will typically be less than a cheap one.

Failure of the lamps is typically the reason that most torches are discarded. High performance Xenon-filled lamps must withstand significant internal pressure from the gas, which translates into longer lamp life. As mentioned earlier, the inherent long life of LEDs renders lamp replacement redundant and their low battery consumption rate adds to the savings.

Finally, the materials and design standards used to create torches that pass the various tests necessary for ATEX hazardous location approval ensure that the lights are built to withstand the rigors of industry. A buyer has the choice to pay now or pay later for another torch. . .

*It is imperative that a torch used by a professional such as a fire fighter or plant maintenance technician operates reliably in the field.*

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# Torches and Po

## Lighting the Emergency Scene

EFFECTIVE LIGHTING IS AN essential requirement for fire fighters often operating at emergency scenes where there is complete darkness, with little or no artificial lighting and with visibility further restricted by smoke. Having robust and reliable portable lighting apparatus, which allows them to see more clearly and are lightweight and easy to carry, can significantly increase the chances of a successful outcome to an emergency rescue.

**By Mike Shimwell,  
Director of portable  
lighting specialist  
S A Equipment**

It is essential that rescue teams have access to a wide variety of lighting apparatus, so they can cope with a multitude of emergency scenarios from a small house fire to a major inferno in a large commercial building. Any equipment selected should allow them to work quickly, effectively and safely.

On arrival at an emergency scene any equipment that enables a rapid assessment of the damage to be made can be invaluable to the overall speed and success of a rescue mission. Portable scene lighting systems, which can illuminate surrounding structures or large ground level areas, are ideal for this use. To ensure the most reliable and effective product is selected there are a number of features to consider including the unit's construction, weight, ease of erection, lamp type, illumination capacity and power source.

Portable scene lighting systems constructed from aluminum are ideal as they are tough, yet also lightweight enough to be carried by hand to where

they are needed. For ease of erection, features such as spikes or wide-angle feet allow units to be easily pitched into the ground, while the use of pneumatic masts enable the height of units to be raised or lowered swiftly with a simple pump action.

There are a number of lamp types to consider for those selecting portable lighting apparatus. Halogen lamps in particular offer exceptionally bright levels of light, but can be fragile, may cause a drain on any accompanying power generator unit and can be temporarily blinding if looked at directly. There are however a number of more robust alternatives available offering comparable levels of light. For example, twin compact fluorescent lamps offer extremely powerful levels of illumination and avoid glare, as they emit a diffused light. For even greater illumination performance lighting units, which are linkable in a series are perfect as they combine to create an even greater spread of light.

*Halogen lamps in particular offer exceptionally bright levels of light, but can be fragile, may cause a drain on any accompanying power generator unit and can be temporarily blinding if looked at directly.*

Portable lighting systems that can be powered from a number of different sources provide greater flexibility during an emergency. There are now a number of battery powered scene lighting systems available, which can also be powered off a small generator and even a vehicle dashboard.

Once an assessment of the emergency scene has been made, other lighting apparatus such as handlamps become critical to the rescue mission itself. Handlamps are an essential item when entering buildings or other confined spaces with unfamiliar layouts and impaired visibility, as they allow fire fighters to see more clearly in dark smoke filled environments. To ensure the most reliable and effective product is selected there are a number of key areas to look at including the unit's construction, lamp and beam performance, built-in safety features, charging capacity and battery performance.

The material that a handlamp is made from is crucial particularly when you consider the number of apparatus each fire fighter has to carry and the harsh conditions they have to operate within. Consider handlamps made from thermoplastic materials, as they are both robust and lightweight and able to cope with extreme temperatures. A lamp's intensity and beam performance is also essential. This is now a vast range of lamp options available including, halogen, krypton and xenon, which can produce the powerful sharp narrow beams of light necessary to cut through thick hanging smoke or dust, an essential requirement when working within

# Portable Lighting

the scattered remains of collapsed buildings.

Another important attribute to consider when selecting lighting equipment are intrinsic safety and power management features. Many battery-powered hand lamps now have warning indicators built into them that can inform a user if the power is getting low. Dual power switches are often manufactured into the product as well, making it possible to switch onto a lower power option if required. This provides valuable extra usage time, which can make a vital difference in extended rescue operations.

Battery performance plays an important role in the operational effectiveness of hand lamps and torches. While some services prefer to utilise dry cell batteries, others take advantage of the latest rechargeable systems. Ongoing advances in rechargeable battery technology now offer lighter batteries that offer increased power, longer life between charges and quicker recharging times than ever before.

Among the most popular battery type in use today is the Nickel Cadmium (Ni-Cd) type. Effective maintenance of rechargeable batteries is essential to prolong their life and maximise operational use. Ni-Cd batteries in particular are known to suffer from a "memory" effect, whereby if they are recharged before they have been fully discharged, the battery begins to act as if it has a smaller and smaller charge capacity. The best engineered Ni-Cd powered lamps feature sophisticated control electronics which minimise the



potential for a memory effect.

Some manufacturers now offer hand lamps and torches with the latest Nickel Metal Hydride (Ni-MH) batteries, which combine exceptionally light weight with long life and very rapid recharging and no "memory" effect, making it even easier to maintain batteries in optimum condition for effective long-life performance.

It is not unusual for modern fire fighters to be called out to more specialist emergencies involving hazardous

applications, such as a fire at a chemical, gas, oil or nuclear plant. To contain the blaze fire fighters may have to enter adjacent areas, where potentially hazardous gases may also be present. It is essential that any lighting apparatus they use in these areas can be operated safely and effectively without creating further problems.

These applications are listed under the new European ATEX (94/9/EC) directive, which was introduced on the 1st of July 2003 with a view to minimising the possibility of an explosion. Under the directive, hazardous areas are defined as: (i) mining and (ii) surface non-mining and offshore installations; Zones 0, 1 and 2 for gases vapours and mists; and Zones 20, 21 and 22 for dusts. All lighting equipment used in designated ATEX zones must comply with the ATEX guidelines. Typically manufactured using the latest hi-tech polymers, ATEX compliant lighting is anti-static to prevent the possibility of a spark being emitted and ensure that lighting can be operated safely without comprising effectiveness.

Regular maintenance is just as important as the many other features built into lighting products to improve their overall effectiveness and helps to sustain performance levels in testing conditions. It is the final important consideration to think about before purchasing any lighting equipment.

Replacement of parts subjected to fair wear and tear and replacement of lamps is a fact of life for any company making heavy use of its products. Ideally fire station managers should look for a supplier who can offer these replacements as part of an after care sales service. A support kit offering a reserve stock of lights will also ensure that fire services have products available for immediate use in the unexpected event of a unit failure. Also the provision of spare units could be offered in a package to provide extra cover in the event of emergencies on an unprecedented size or scale.

*Ni-Cd batteries in particular are known to suffer from a "memory" effect, whereby if they are recharged before they have been fully discharged, the battery begins to act as if it has a smaller and smaller charge capacity.*



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*Argus®3 Thermal Imaging Camera*

Technology has come a long way since the first vacuum tube based devices. Picture quality has improved beyond recognition, reliability has increased five-fold and the cost of ownership has vastly reduced. Additionally, thermal imaging cameras are offered with stronger warranties – e2v technologies in particular offers an extended two-year warranty for peace of mind.

## Argus®3 – Image Capture

Take the Argus®3's image capture, for example. Being the first camera to offer this unique feature, the ability to take 26 images and store them on the camera for later download to a PC/Laptop not only enables fire fighters to capture vital evidence before it is destroyed by the blaze, but also facilitates incident reporting and training exercises. Used for routine, controlled inspections of engine rooms and mechanical or electrical equipment, these images can form the basis of a thorough portfolio of records for internal or external auditing purposes.

## Argus®3 – 8 Colour Settings

Argus®3 provides eight colour schemes – incrementally from monochrome to full colour. This allows end-users to customise cameras, choosing the preferred and most functional colour scheme for their application. Shown opposite is an example of the eight colour schemes.

## Argus®3 – Suitable for Multiple Applications



*Argus®3 BST and ASi Cameras*

e2v technologies has recognised that increased expectations from the market necessitate even greater technological advancements within the camera. Recognising that customers need apparatus to suit multiple applications and budgets, the Argus®3 comes with a choice of solid-state sensors – BST and ASi (microbolometer). The Argus®3 casing is made from high quality Radel® R-5100, chosen for its strength, resistance to heat, water and impact. The camera is sealed to IP67, to withstand driving spray and short-term immersion in water to a depth of one metre, and can tolerate temperatures of 60°C for one hour, with higher temperatures being tolerated for shorter periods.

## Argus®3 Accessories

Additionally, the Argus®3 boasts an infrared remote control and PC software, allowing end users to configure the camera to their specific needs; no

other control or adjustment equipment is required. A brigade's own logo can be uploaded onto the Argus®3 splash screen, enabling improved asset tracking; the time and date can be set and colour options can be selected prior to entering a fire scene. Once all settings have been chosen, simple button operation allows the user to switch the camera on and off, take pictures, activate the digital zoom facility and remote telemetry (if included). Ambient temperature measurement as standard on all camera models (with spot temperature an optional feature) allows accurate reading of surrounding conditions.



*Argus®3 Standard Accessories*

## Argus®3 – want to find out more?

It is clear that the host of features and options offered on today's cameras, in addition to increased reliability and technological advances, make thermal imaging not only a wise choice but also a sound investment. To find out more, visit us at Interschutz in Hall 27, Stand KO1, or visit [www.argusdirect.com](http://www.argusdirect.com).



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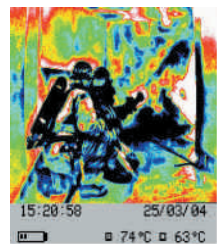
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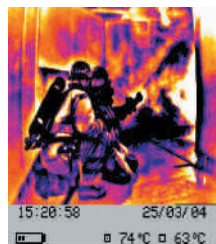
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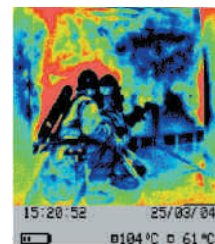
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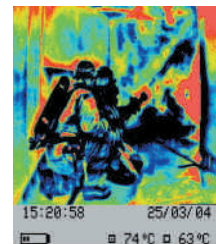
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# ***Reinforced Solutions***

# INTERSCHUTZ 2005 *Preview*



## INTERSCHUTZ

DER ROTE HAHN

INTERNATIONALE MESSE FÜR RETTUNG,  
BRAND-/KATASTROPHENSCHUTZ UND SICHERHEIT  
INTERNATIONAL TRADE FAIR FOR RESCUE SERVICES, FIRE  
PREVENTION, DISASTER RELIEF, SAFETY AND SECURITY  
HANNOVER 6-11 JUNE 2005



Things are looking good for INTERSCHUTZ and INTERPOLICE 2005. Two months ahead of the start of the "International Exhibition for Rescue, Fire Prevention, Disaster Relief, Safety and Security" (6 - 11 June) at the Hannover Exhibition Center, more than 1,000 exhibitors from around the world have already booked their space at the shows. This year sees debut presentations by leading companies from Sweden, Spain, Portugal and Poland. The exhibiting firms, institutions, organizations, trade associations and other professional bodies will be staging their displays in Halls 12, 13, 26 and 27 as well as on the open-air site. Some 130,000 visitors are expected to attend.

The line-up for 2005 is once again a unique mix of exhibition, forums,

special presentations and live events. Featured for the first time are four "Theme Days", where the focus is on security in the home, at work, at airports and on roads and railways.

At INTERSCHUTZ, which takes place once every five years, the industry will be showing the latest technologies, trends and services for protection and prevention, rescue work, contingency planning and organization. State-of-the-art technical aids, monitoring and surveillance systems and communications equipment complete the picture.

### Strong showing from China and Russia

The exhibitor recruitment campaign carried out by Deutsche Messe AG at last October's "China Fire" trade show in Beijing has borne fruit in abun-

dance. Around 30 Chinese firms, mainly manufacturers of fire extinguishers and extinguishing agents, have already booked stand space (as compared with only six firms in 2000). And for the first time the China Fire Protection Association (CFPA) is represented at INTERSCHUTZ with a large information stand in Hall 27.

The Russian Federation will present its latest developments for disaster relief in the form of two national pavilions (in Halls 26 and 27). Featured items include the use of robots and aircraft to combat forest fires and environmental damage, the prevention and clean-up of disaster damage, emergency rescue and the training of specialists in risk analysis and risk management. New technologies for fire prevention in high-rise buildings, civil engineering structures and multi-purpose buildings complete the program.

In addition to China and Russia, other countries that have booked space for national displays are Finland, France, Sweden, Poland, Spain and the USA.

### International conventions

The industry's flagship trade fair is also the perfect setting for international conferences. So the Hannover Exhibition Grounds will simultaneously host the World Fire Services Conference and the FEU convention (Federation of EU Fire Officers' Associations).

For more information visit [www.interschutz.de](http://www.interschutz.de)



# INTERSCHUTZ 2005 Preview

## Company Profiles

### Groupe Leader introduces the MT236, designed for rapid smoke exhaustion



An ultra-compact positive pressure ventilation (PPV) smoke ventilator from French company **Groupe Leader**, the MT236 has the best airflow/size ratio on the market. Already the leader in its category in Europe, the MT 236

has become an essential tool for fire-fighters.

The airflow from the MT236 can reach 36,000 cu. m per hour. This capacity ensures rapid smoke exhaustion, an immediate fall in temperature and the return of visibility conditions that are essential for the effectiveness of rescue teams saving victims.

The powerful air jet is driven by a resin turbine, and an enveloping frame protects all the components of the PPV ventilator. As its dimensions are reduced to the minimum, the MT236 can easily be housed in any vehicle. It is powered by a petrol engine and fitted with an automatic

cut-out system in case of low oil.

The MT236 is part of the MT200 range designed by Groupe Leader. The range consists of four portable 4-stroke engine PPV ventilators for use by fire-fighters in smoke-filled premises. With rapid smoke extraction, this equipment ensures better visibility, lower temperature and a reduction in toxicity. Their size and design makes all the models in the MT200 range stable and easy to handle and transport.

In order to expand internationally, Groupe Leader seeks trade partners for the distribution or inclusive import of its products.

For more information, please contact:

**GROUPE LEADER**

BP 351

76056 LE HAVRE Cedex

France

Tel: +33.235.53.05.75

Fax: +33.235.53.16.32

Email: [export@groupe-leader.fr](mailto:export@groupe-leader.fr)

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- ◆ Kermel® Heroskin
- ◆ Kermel® Profil
- ◆ Kermel® R-Liner
- ◆ Kermel® V50 / V70

### Comfort and security

Kermel® fibre can be found in a complete range of textile products for fire fighters to meet every demand and every standard.

### Innovation

KERMEL has developed a whole range of innovative solutions using its Kermel® fibre. Among such products are:

- new outershells for fire suits
- new thermal barriers
- new complexes
- new underwear

### Contact us for any particular requirements!

KERMEL is a manufacturer of aramid fibres utilised in protective clothing against heat and flames, as well as fibres used in the field of hot gas filtration.



Pictures : West Yorkshire Fire Service

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# INTERSCHUTZ

DER ROTE HAHN

INTERNATIONAL EXHIBITION FOR RESCUE,  
FIRE PREVENTION, DISASTER RELIEF, SAFETY, SECURITY  
HANNOVER 6 – 11 JUNE 2005

At the same time as:

**INTERPOLICE**

[interschutz.de](http://interschutz.de)

Deutsche Messe AG  
Hannover, Germany

## Selected Exhibitors

### Akron Brass

[www.akronbrass.com](http://www.akronbrass.com)  
Hall 12 Stand E76

### Albach GmbH

[www.alco-frankfurt.de](http://www.alco-frankfurt.de)  
Hall 12 Stand A30

### Albert Ziegler

Pavillion P32, EG

### Angus Fire

[www.angusfire.co.uk](http://www.angusfire.co.uk)  
Hall 13, Stand C28

### Bavaria Egypt

[www.bavaria.com.eg](http://www.bavaria.com.eg)  
Hall 13, Stand C40

### Bristol Uniforms

[www.bristol-uniforms.com](http://www.bristol-uniforms.com)  
Hall 27 Stand NO7/1

### Bronto Skylift

[www.bronto.fi](http://www.bronto.fi)  
Open air site FG Stand F08

### BW Technologies

[www.gasmonitors.com](http://www.gasmonitors.com)  
Hall 27, Stand G16

### Celanese Advanced Materials

[www.pbgold.com](http://www.pbgold.com)  
Hall 27 Stand H21

[www.interschutz.de](http://www.interschutz.de)



#### Open-air site

Vehicles and vehicle equipment  
Fire extinguishers, sprinkler systems and  
extinguishing agents  
Rescue services/equipment and environmental protection  
First-aid and medical equipment  
Personal protective gear and identification  
Professional associations/organizations

#### Hall 12

Vehicles and vehicle equipment  
Model making

#### Hall 13

Fire extinguishers, sprinkler systems and  
extinguishing agents  
Fire station and workshop equipment  
Building design and construction, structural fire protection  
and safety  
Professional associations/organizations, service providers

#### Hall 26

Technical assistance and environmental protection  
First-aid and medical equipment  
Professional associations/organizations  
Personal protective gear

#### Hall 27

Personal protective gear and identification  
Control room and communications equipment  
Data processing and administrative equipment  
Professional associations/organizations, service providers  
Commercial security services

#### Hall 27

INTERPOLICE  
International Exhibition  
for Police and Internal Security



#### Demonstration site

#### Convention Center



DEUTSCHER PRÄVENTIONSTAG  
GERMAN PREVENTION CONGRESS  
6 – 7 June

### Chemguard

[www.chemguard.com](http://www.chemguard.com)  
Hall 27, Stand K23 (28)

### Collins Youldon

[www.collins-youldon.co.uk](http://www.collins-youldon.co.uk)  
Hall 12 Stand B65

### Crash Rescue Equipment

[www.crashrescue.com](http://www.crashrescue.com)  
Hall 27 Stand K23

### Dafo Fomtec

[www.fomtec.com](http://www.fomtec.com)  
Hall 13 Stand B18

### E2V Technologies

[www.argusdirect.com](http://www.argusdirect.com)  
Hall 27 Stand K01

### FSI North America

[www.fsinorth.com](http://www.fsinorth.com)  
Hall 26 Stand E64

### Groupe Leader

[www.groupe-leader.fr](http://www.groupe-leader.fr)  
Hall 13 Stand B40

### Haztec International

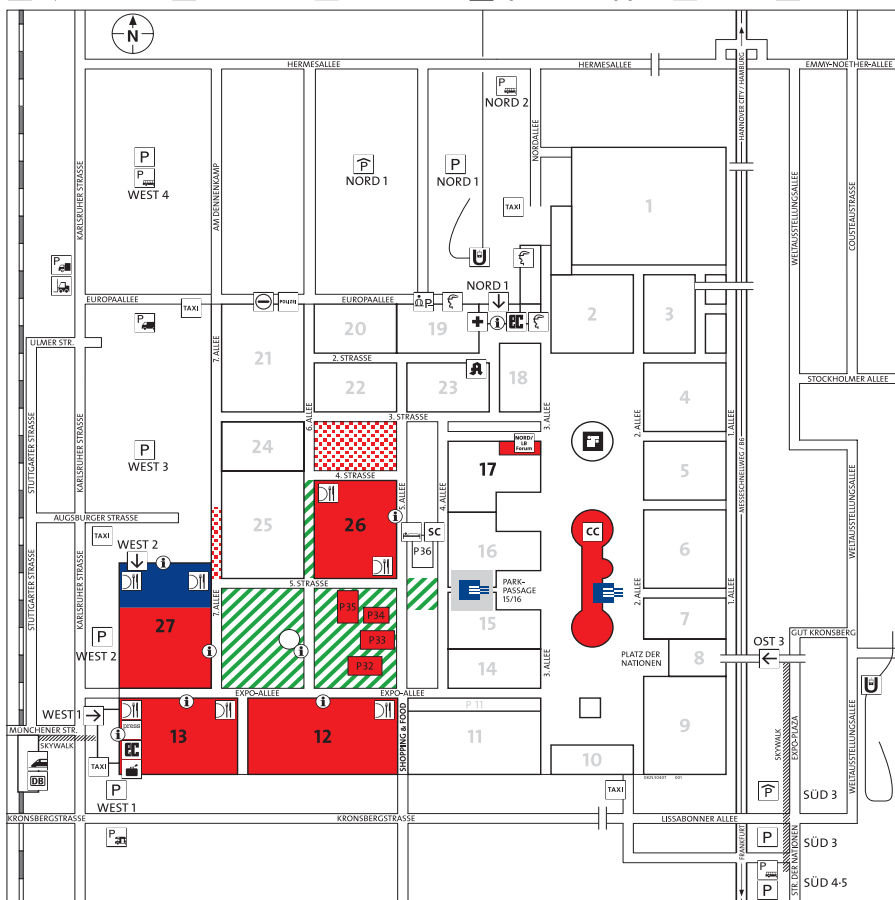
[www.haztec.biz](http://www.haztec.biz)  
Hall 12 Stand D55



**INTERSCHUTZ**  
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 HANNOVER 6-11 JUNE 2005



**INTERPOLICE**  
 INTERNATIONALE FACHAUSSTELLUNG  
 FÜR POLIZEI UND INNERE SICHERHEIT  
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 HANNOVER 6-11 JUNE 2005



**MDM Publishing Ltd**  
[www.iffmag.com](http://www.iffmag.com)  
 Hall 12 Stand C60/1

**Nike Hydraulics**  
[www.nikehydraulics.com](http://www.nikehydraulics.com)  
 Hall 12 Stand E67

**Plastisol**  
[www.plastisol.com](http://www.plastisol.com)  
 Hall 12 Stand B30

**RAE Systems Europe**  
[www.raesystems.com](http://www.raesystems.com)  
 Hall 27, Stand N11/2

**Rosenbauer International**  
[www.rosenbauer.com](http://www.rosenbauer.com)  
 Hall 12 Stand A01

**Total Walther**  
[www.totalwalther.de](http://www.totalwalther.de)  
 Hall 13, Stand C40

**Trelleborg**  
[www.trelleborg.com](http://www.trelleborg.com)  
 Hall 27 Stand K44

**Tyco Bulding Services Products**  
[www.tycosafetyproducts.com](http://www.tycosafetyproducts.com)  
 Hall 13, Stand B60

**Tyco Safety Products**  
[www.tycosafetyproducts.com](http://www.tycosafetyproducts.com)  
 Hall 13, Stand B10

**Unifire**  
[www.unifire.com](http://www.unifire.com)  
 Hall 12 Stand F81

**Vema Lift**  
[www.vema.fi](http://www.vema.fi)  
 Open air site FG Stand G13

**Helmet Integrated Systems**  
[www.helmets.co.uk](http://www.helmets.co.uk)  
 Hall 27 Stand M01

**Kermel**  
[www.kermel.com](http://www.kermel.com)  
 Hall 27 Stand L14

**Kerr Fire Fighting Chemicals**  
[www.kiddefiresystems.com](http://www.kiddefiresystems.com)  
 Hall 13, Stand C28

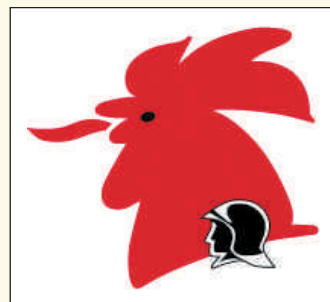
**Kidde de Mexico**  
[www.kiddefiresystems.com](http://www.kiddefiresystems.com)  
 Hall 13, Stand C28

**Kidde Fire Protection**  
[www.kiddefiresystems.com](http://www.kiddefiresystems.com)  
 Hall 13, Stand C28

**Kidde Fire Trainers**  
[www.kiddefiresystems.com](http://www.kiddefiresystems.com)  
 Hall 13, Stand C28

**Lenzing**  
[lenzing-fr@lenzing.com](mailto:lenzing-fr@lenzing.com)  
 Hall 27 Stand N17/1

**Max Widenmann**  
[www.awg-qiengen.de](http://www.awg-qiengen.de)  
 Hall 12 Stand A30





# INTERSCHUTZ 2005 Preview



Chemguard is a manufacturer and supplier of foam concentrates, dry chemicals and engineered systems. Chemguard's operations are a synergistic blend of research, design and manufacturing found nowhere else in the industry. From its innovative patents to

persistence in delivering a superior product, the dedication to a high level of achievement can be found in each department, in each employee and each process.

## Foam Concentrates

Chemguard offers the most extensive line of environmentally-friendly UL Listed foam concentrates in the industry with over 20 UL Listed products including AFFF, AR-AFFF, High Expansion, Fully Approved USDA Class A, Training Foams, and Protein Based Foams.

Over the last two years, Chemguard has also introduced our ECOGUARD concentrates, a fluorosurfactant and fluorine free line of fire fighting foams designed to reduce even further the release of fluorine products into the environment.



## Engineered Systems

Chemguard's engineered and manufactured systems bring a rapid, thorough and economical response to all fire types. A Chemguard foam system is more than the sum of its parts because it is designed and engineered to your application specifications.

Our extensive engineered system line includes bladder tank and pump type balanced pressure proportioning systems; as well as in-line balanced pressure proportioning systems. Chemguard manufactures High Expansion foam systems with single High Expansion generators up to 735m<sup>3</sup> per minute; large dry chemical systems with single units up to 3000kg; twin-agent (AFFF/Dry Chemical) units; foam/water monitors; nozzles; eductors; ratio flow controllers (proportioners) including our unique Ultra-Wide Proportioner; foam makers and foam chambers; as well as specialized proportioning, storage and monitor trailers. Our products meet international fire fighting standards and many are UL Listed and/or FM Approved.

## Specialty Chemicals

Chemguard has developed and manufactures its own line of fluorosurfactants and specialty hydrocarbon surfactants specifically designed for use in fire fighting foams. These highly developed surfactants enable Chemguard to offer the most environmentally friendly high performance foam concentrates available.

For more information contact:  
Chemguard  
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# S.O.P.



## MAKE FOAM PART OF YOUR STANDARD OPERATING PROCEDURE!

Firefighters worldwide have experienced the incredible effectiveness of Class A foam as a firefighting tool. Reliable, field-proven FoamPro<sup>®</sup> systems are the easiest, most accurate way to get foam to any fire. All units are CAFS-compatible and can be installed on any apparatus. These state-of-the-art proportioners have helped thousands of fire departments save lives, property, time and money.

Attack your next wildland, structural, airport or marine fire with FoamPro!



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HANNOVER 6-11 JUNE 2005  
Hall 27 Stand K23 (15)

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# INTERSCHUTZ 2005 Preview

## Kermel<sup>®</sup>, the innovation fibre



Colmar, March 2005 – Innovation is a key element within KERMEL, who has developed a new range of products for the manufacture of fire suits.

For more than thirty years the Kermel fibre has been available to protect against heat and flames. It is used in many ways inside fire suits : outer fabrics, membrane support, thermal barriers and linings.

### A new range of outer fabrics for fire suits

A wide range of outer fabrics meet the ever-increasing requirements in terms of protection, durability and comfort. In addition to the Kermel HTA<sup>®</sup> range (much appreciated by fire fighters worldwide), KERMEL has developed a new range of outer fabrics made out of Kermel<sup>®</sup> fibre:

- **Kermel<sup>®</sup> X50:** This new Kermel fabric is a true thoroughbred in outer shell fabrics offering high mechanical properties in tear and tensile strength linked to a special spinning process. It brings the best ever TTP/weight ratio currently available.
- **Kermel<sup>®</sup> Pro-Active:** Its special two-ply weave ensures excellent tear strength results and exceptional inherently thermal properties.
- **Kermel<sup>®</sup> Profil:** Its special rip-stop weave gives it superb tear strength. Its properties in terms of long-term appearance are exceptional and its performance meets the requirements of the standard EN 469.

### A new range of Kermel knits

Due to its suppleness and intrinsic softness, Kermel fibre allows the manufacture of different high-quality fire-resistant knits that contribute efficiently to improved protection against thermal



hazards while providing wearer comfort and easy maintenance for the user.

Some of the applications are light-weight undergarments or clothing such as polo shirts, providing maximum comfort for hot weather conditions, hoods, pullovers, T-shirts. . .

KERMEL will exhibit those developments at INTERSCHUTZ/INTERPOLICE in June 2005, Hall 27, stand L14.

Kermel<sup>®</sup> is a registered trademark of the KERMEL company.

KERMEL is the leading European manufacturer of aramid fibres dedicated to protective clothing against heat and flames. Fire suits for fire fighters, together with protective coveralls for riot-police, military and industrial uses are some of the most popular applications.

In parallel with these developments, KERMEL is continuing its diversification, especially in the field of hot gas filtration using its Kermel<sup>®</sup> Tech fibre.

For more information contact:

Véronique Chanel

Tel: 33 (0)3 89 20 47 43

Email: veronique.chanel@kermel.com

## Don't firefighters deserve the best?

# 40 YEARS Duraline

If they gave a long-service medal to fire hoses, only one would qualify. For forty years Duraline has provided outstanding performance to firefighters around the world. It has carried the BSI Kitemark symbol of product quality for longer than any other covered fire hose. And to this day it still offers the lowest possible maintenance costs. Duraline, the only hose that truly passes the test of time.

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# INTERSCHUTZ 2005 Preview

## FoamPro, the industry leader in foam technology, offers a wide variety of proportioning systems that are fully automatic and easy to use

An operator simply pushes a button to activate the system. Flow-based, microprocessor control technology allows us to deliver concentrate on demand. By injecting into the discharge side, proportioning performance is not affected by external factors such as nozzle, length of hose lay, nozzle elevation or incoming pressure to the water pump. Full fire pump discharge performance is delivered to the outlet as the flowmeter doesn't restrict water flow. The resulting foam solution is very precise which translates into a significant dollar savings in concentrate purchases. The ultra-bright LED digital control/display provides the operator with vital system information including water flow, injection percentage, total water and foam usage.

Renowned for its reliability, Foampro has proven itself since 1989 on firegrounds around the world and in the harshest conditions. We continually develop new and improved high-tech proportioning systems by incorporating ideas and suggestions from the field. To assure quality and compliance, only FoamPro requires system designs to be subjected to intense third-party testing. Stringent electronic emission control is verified according to MIL-STD 461E. Designs are then put to grueling SAE and U.S. military specifications for heavy-use, off-road mobile apparatus by independent evaluators.

Various sizes from 0.01 usgpm through 300 usgpm are available to meet your specific Class A and/or B application. Numerous optional accessories allow customized product configuration to meet your exact requirements.

The new AccuMax multi-point injection proportioner is specifically designed for Class B foam applications requiring high flows with variable percentage control at each discharge outlet. FoamPro Power-Fill systems allow vehicle foam cells to be refilled safely, without climbing on top of the apparatus.

All systems can be easily retrofitted to existing vehicles. Common usages include: Municipal, Brush/Wildland, Industrial, Compressed Air Foam Systems (CAFS), Marine, and ARFF.

For more information contact:

**European/Middle East Sales Manager**

**Thoams Fahrenbach**

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Postfach 1125

Georgenhäuser Str. 9a

D-64409 Messel

Tel: +49 (0) 700 425 33 876

Fax: +49 (0) 700 425 33 876

Email: [tfahrenbach@foampro-europe.de](mailto:tfahrenbach@foampro-europe.de)

Website: [www.foampro.com](http://www.foampro.com)

## MSA Introduces Galaxy™ Automated Test System for MSA Portable Gas Detection



The MSA Instrument Division proudly announces the release of the Galaxy Automated Test System for MSA portable gas detection instruments. The new MSA Galaxy System has the latest features expected in an automated record-keeping and calibration test system. These features include ease of use and versatility, making the MSA Galaxy Automated Test System the perfect choice for managing your MSA gas detection equipment.

The Galaxy Automated Test System operates without the touch of a single button. After setup, users place their instrument in the test stand and the Galaxy System will automatically perform the test. The Galaxy System is stand-alone, requiring no computer, controller or network interface. This new system from MSA offers ease of use with minimal training needed, as all gas tubing and electrical connections are pre-connected. Other features include a wireless or wired network interface, instrument charging, memory card, test receipt printer and an in-line gas cylinder holder.

Where AC power may not be easily accessible, the Galaxy System has a replaceable battery pack available which can

provide up to 100 tests per instrument test stand. In addition, up to ten specific systems can be interconnected as part of this durable, innovative design. With automated recordkeeping capabilities that eliminate the need for handwritten records of instrument calibration history, the MSA Galaxy System can help to lower the overall total cost of ownership of your MSA gas detection instruments.

The Galaxy Automated Test System interface for data retrieval and reporting is extremely easy to use. Any web browser such as Internet Explorer or Netscape Navigator can be used to access the data of a network-enabled Galaxy System, including calibration and bump check records as well as due dates for instrument calibration.

For more information on the Galaxy Automated Test System, request literature 0800-27, by dialing 1-800-MSA-2222, or contact your nearest MSA distributor. To learn about MSA and our other high-quality products, visit our website at [www.msanet.com/instruments](http://www.msanet.com/instruments).

Or contact:

**Cecelia Weber**

**MSA Instrument Division**

P.O. Box 427, Pittsburgh, Pa. 15230

Tel: 724 776-8721

Fax: 724 776-8892



**Industrial**







Visit us at International Fire Expo 2005 - Hall 17, Stand E10;  
and Interschutz - Hall 013, Stand B10



# Foam fire fighting systems - we've got it covered

When quick reactions under extreme stress are needed, it matters that the tools to deliver are both unquestionably reliable and specifically designed for the task. If you fight fire fast with the right combination of product and delivery system, you can save lives, critical assets and scarce resources.

Skum brings over 70 years of invaluable expertise to fire fighting. Backed by a programme of continuous research and development, Skum has an enviable reputation at the forefront of fire fighting technology and is renowned worldwide for its quality and innovation. Innovations such as Hot Foam™ systems for enclosed spaces or the unique FJM corrosion free monitor.

In short, Skum has it covered.

## Typical high risk applications

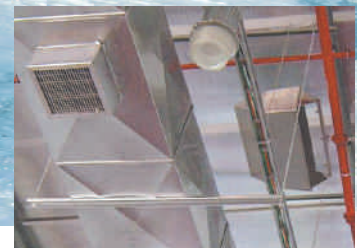
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Offshore support and Fire fighting vessels
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Systems for aircraft hangars



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Security

# Flammable liquid fires

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'LIQUID FUELS' ABOUND IN today's world, there being a colossal international market in fuels derived from crude oil. The stability of the oil market is a major influence in world affairs. In the early days of the oil industry, that is about 100 years ago, the countries with the highest production of crude oil were the US, Russia and Mexico. Offshore oil production began, in the Gulf of Mexico, exactly 60 years ago.

There are therefore liquid fuels derived directly from the fractionation of crude oil, these being gasoline, kerosene, diesel and residual fuel oil. Very often a gasoline will not have been entirely a 'straight run' distillate but will have been blended with something, perhaps reformed naphtha, to raise its octane rating. Mention is made of this because this article is being written a few days after the fatal accident at the BP Refinery in Texas City which, it appears, occurred at an isomerisation unit where hydrocarbon was being chemically modified for subsequent blending with gasoline.

Flammable liquids additional to crude oil distillates include alcoholic fuels such as methanol ( $\text{CH}_3\text{OH}$ ) and ethanol ( $\text{C}_2\text{H}_5\text{OH}$ ). There are also very many other oxygenated hydrocarbons which will be found in the chemical process industries, three examples being cyclohexanone ( $\text{C}_6\text{H}_{10}\text{O}$ ) and acetaldehyde ( $\text{CH}_3\text{CHO}$ ). These will, in today's world, most likely have been made from oil-derived starting materials, though some such substances can be made from coal or from natural gas via synthesis gas. The first process in effecting a conversion from a distillate to a particular chemical compound is

cracking. The cracking process leaves behind it in addition to the desired product (usually olefins) unwanted cracking residue which might be suitable for blending with the heavier components of the crude to make a fuel oil or for treatment with steam to make a gaseous fuel. These examples, chosen from a multitude of such operations in the hydrocarbon industry, have been described in order that a reader will be reminded of the immense scale of hydrocarbon liquid handling and processing and the associated hazards.

This introduction has been con-

cerned with materials which are liquids at room temperature and pressure. There are some hydrocarbons which are stored under their own highly super-atmospheric vapour pressure in strong vessels at ordinary temperatures and are liquid under such conditions although they are gases at atmospheric pressure. The best example is propane, which is the primary constituent of liquefied petroleum gas (LPG). Vinyl chloride monomer (VCM) is another example. There will be discussion of hydrocarbons which are 'liquids' in this sense later in the article. There are also some important flammable liquids which are cryogenics, the most obvious being liquefied natural gas (LNG). This too will be briefly covered later.

## HEATS OF COMBUSTION

Distillates from crude oil (and indeed the heavy residue remaining, which

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# Flammable liquid fires

might form the basis of a fuel oil) have a heat of combustion in the range 43–46 MJ kg<sup>-1</sup>, about twice that for a bed-moist coal. Hydrocarbons are therefore powerful heat releasers. Oxygenated hydrocarbons of course have in effect been partly ‘burnt’ already therefore their heats of combustion are somewhat lower than those of unsubstituted hydrocarbons. For example, the heat of combustion of acetaldehyde is 27 MJ kg<sup>-1</sup>.

## IGNITABILITY AND FLASH POINTS

The storage and transportation safety of flammable liquids is usually assessed on the basis of their flash points. The flash point of a particular liquid is of course the minimum temperature of the bulk liquid at which there will be a flash if a flame is brought into contact with the vapour above its surface. Such a flash requires that the vapour above the liquid be at a concentration above that corresponding to the lower flammability limit. Flash points of the liquids named in the previous paragraph are given in the shaded area below<sup>1</sup>.

methanol + 12°C

ethanol + 8°C

cyclohexanone + 46°C

acetaldehyde – 38°C

Gasolines, like acetaldehyde, have flash points which are below 0°C, the precise value depending on the composition of the gasoline which in turn depends on the nature of the parent crude and which hydrocarbon type – aromatic, alkane or naphthene – was in preponderance. A kerosene for household use will have a flash point in the neighbourhood of 40°C whilst the value for a diesel might well be higher than 100°C.

<sup>1</sup>Values are from a ‘closed cup’ flash points and are taken from the current edition of the SI Chemical Data Book published by Wiley.

Flash points have an important legal function. If it is desired to transport or store a particular flammable liquid its flash point will need to be determined and documented according to the requirements of one of the standards bodies such as ISO, British Standards or ASTM. The test report will need to be signed by an individual authorised by the standards body. In the event that there is any subsequent evidence or suggestion of negligence on the part of the organisation storing or transporting the substance, the report of the flash point test is an important legal document. There can be difficulties if a substance is being transported between countries. It might happen that a particular liquid originating in the UK is to be air freighted in a laboratory-scale quantity to the US. Before a case can be made that transportation is safe the flash point must be determined, and since the destination of the substance is the US an ASTM report is preferable to say a British Standards one. It is because of situations such as the hypothetical one described in the previous couple of sentences that ASTM accreditation is available in the UK, via UKAS.

Of course, the flash points of very many pure organic substances are tabulated in standard reference works on fire protection engineering. In the

event that the flash point of a substance to be stored or transported is recorded in an authoritative text is it legally adequate to invoke the literature value without doing a measurement to check it? The author of this piece is a thermal scientist, not a lawyer, and would prefer not to give a definitive answer to that question. What he can say with conviction is that for a number of simple organic compounds including dimethyl ether and formic acid flash point values in the recent literature are significantly in error. Such errors have been reported in the research literature, in periodicals including ‘Journal of Loss Prevention in the Process Industries’, and also in the Proceedings of a major conference on fire safety held in the US in 2001. It will take a few years for the corrected values to filter through to some of the tabulations of flash points in the major reference works. Meanwhile, would the use of a recent but incorrect literature value be defence in the event of an accidental fire with one of these compounds, or would a court rule that the organisation using the compound had a duty to stay up to date with developments and that therefore its management ought to have been aware of the corrections in the research literature?

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# Flammable liquid fires

## COMBUSTION BEHAVIOUR IN AN ACCIDENTAL FIRE

If a vessel of a flammable liquid is burst open so that its contents exit all at once, there will be vaporisation and, if there is ignition, rapid reaction with oxygen such that the entire amount is burnt in time of the order of seconds or at most a few tens of seconds. This of course is fireball behaviour. If there is not immediate ignition therefore the vessel liquid contents settle to form a pool, ignition will result in a pool fire and this form of combustion behaviour will be discussed later.

Returning to fireball behaviour, what has been described is a fireball resulting from catastrophic leakage and ignition of a hydrocarbon which is a liquid at ordinary temperatures and pressures, neither a 'liquefied gas' nor a cryogen. The hydrocarbon might be a single compound or it might be a highly complex mixture such as a petroleum fraction. This leads to the distinction between a fireball and a Boiling Liquid Expanding Vapour Explosion (BLEVE). The latter occurs when a liquefied gas such as LPG or VCM leaks catastrophically. Before leakage the substance was almost entirely in the liquid phase, probably significantly less than 1% of the mass being vapour in the ullage space above the liquid surface. The very rapid conversion to vapour once leakage has occurred is the origin of a

physical not a chemical explosion. On subsequent ignition a fireball ensues. Ignition is probable in such circumstances because the rapidly moving liquid causes static electricity effects which provide an ignition source. But the BLEVE itself is a physical explosion caused by rapid and uncontrolled pressure build-up as the substance changes phase and failure of the vessel under the stress so caused. A non-flammable liquid can BLEVE – there are well documented examples – but obviously such a BLEVE will not be followed by a fireball.

So the term fireball applies to a substance which is a liquid at room temperature (e.g., benzene) which leaks rapidly and ignites, burning itself out in time of the order of seconds as previously noted. A fireball follows a BLEVE when a flammable liquefied gas leaks rapidly. A fireball from a hydrocarbon previously a liquid at room temperature might have a significant overpressure. Confinement of the fireball by walls and other structures will promote overpressure.

LNG will burn as a fireball under conditions of rapid leakage and ignition. There has been an ongoing debate on whether LNG displays BLEVE behaviour. Some discussion of this point took place in the literature in the 'eighties and the author has more than once had enquiries from MSc students who, in the course of their industrial

placements, have been concerned with LNG and heard or read assertions that it can BLEVE. It is sufficient for an article such as this that the reader be aware that the point is under debate and investigation. What is not in doubt is that leaked LNG can display a fireball. This is key input to risk assessment at sites where LNG is stored.

LNG is not the only cryogen in the hydrocarbon industry. Many refrigerants are simple hydrocarbon compounds and during the refrigeration cycle condense to liquid loss of containment of which is of course a major hazard.

A liquid having formed a pool will, if ignited, burn as a pool fire. This form of burning is less powerfully heat-releasing than a fireball and unlike a fireball it can, with considerable quantities of leaked liquids, burn for long enough to become quasi-steady. Notwithstanding the fact that it is less thermally powerful than a fireball, a pool fire can be lethal to a person who is close by when ignition occurs. A good deal of the recent research on pool fires has been in the context of crude oil leakages at offshore platforms. A belief which the present author, having examined it closely, would cautiously endorse is that all hydrocarbon pool fires burn at a rate of about:

$$0.1 \text{ kg m}^{-2}\text{s}^{-1}$$

that is, at 0.1 kg of fuel per square metre of pool area per second. This figure for pool fire burning is sometimes used in quantitative risk assessment.

*LNG is not the only cryogen in the hydrocarbon industry. Many refrigerants are simple hydrocarbon compounds and during the refrigeration cycle condense to liquid loss of containment of which is of course a major hazard.*

### Concluding remarks

This article has covered in an extremely brief way the science of liquid combustion. It will be followed in a later issue by one in which LPG fireballs and the like are discussed more fully in terms not only of the fundamentals but also of case studies.

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# Air monitoring as part of preparedness

**By Gerd Pearson,  
Global Market Manager  
for Fire Brigades,  
Draeger Safety**

*Pic: Courtesy of Draeger Safety*

Firefighters throughout the world know that the quicker they can assess what it is they are dealing with, the quicker they can start work. Smoke and flames are relatively easy to see, unlike the invisible dangers that often accompany toxic or flammable gases. A source of ignition at the wrong time, or entry into a potentially lethal atmosphere could turn an incident into a full blown disaster.

Even if every firefighter were to don compressed air breathing apparatus for every single incident, the need for gas detection systems would still exist. Gases, particularly those from chemical and industrial plants, can have far reaching effects, from the poisoning of nearby personnel through to widespread environmental pollution. They can also have explosive consequences. The use of the right gas detection system will quickly determine the type and level of risk and allow the firefighter to do what they do best – resolve the situation with the utmost safety for all concerned.

The nature of the incident can sometimes point to the type of hazard that may be found and might provide a

useful insight into which type of gas detection system may be required. An earthquake or other natural disaster, for example, might involve town gas, methane, hydrogen sulphide, sulphur dioxide, carbon monoxide or, perhaps, a lack of oxygen altogether. A terrorist incident might feature nuclear, biological or chemical hazards, whilst a wide variety of gases and vapours can be found at different industrial sites.

For instance, in the brewing industry where increased levels of nitrogen are now being used to make a more efferves-

cent beer, there is a danger of oxygen depletion and, as a result, asphyxiation. Colourless, inert and odourless, liquid nitrogen is also used as a freezing agent in hospitals, laboratories and universities. A firefighter entering a confined space or enclosed area in the danger zone could find him or herself with a severe case of oxygen deprivation.

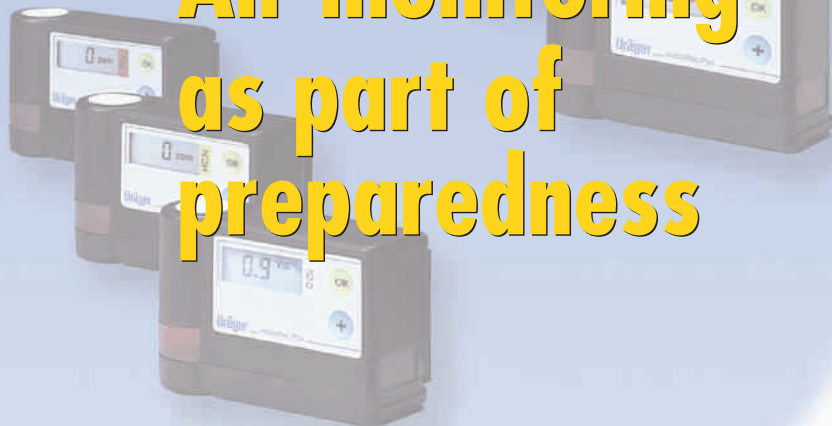
In steelworks, a volatile mix of oxygen and carbon monoxide can create serious blast levels and even the semiconductor industry has its own potential toxicity



*Pic: Courtesy of Draeger Safety*



# Air monitoring as part of preparedness



problems with the use of ammonia, arsine and bromine. A "shout" at a food processing plant could involve high levels of disinfectants or, in refrigeration and cold storage areas, unhealthy levels of ammonia. To compound the problem, it is also possible that toxic and/or flammable gases and vapours that were

created during previous work might still be present, or that hazardous bi-products may be created by the fire itself from otherwise non-hazardous materials.

Whilst not exhaustive, the following lists some of the most common substances that may be encountered:

## SOURCE

Combustion processes such as open fire, tobacco smoke. Vehicle exhaust gas

Cleaning agents, disinfectants, furniture polish, stain removers, shoe polish spray, nail polish remover, correction liquids, pickling agents.

Glues and paints

Insulating material, foams, damping material, chipboards

Gasoline stations

Refrigerants, anti-oxidant in metal furnaces

Food processing, magnesium foundries

Semi-conductor manufacture & rework

Paper and man-made fibres

Decomposing biological matter

## SUBSTANCE

CO<sub>2</sub>, CO, Nox

Toluene and aromatics, hexane and aliphatic hydrocarbons, formaldehyde and other aldehydes, acetone

Toluene and aromatics, hexane and aliphatic hydrocarbons, formaldehyde, other aldehydes

Styrene, formaldehyde

Toluene, benzene and other aromatics, hexane and other aliphatic hydrocarbons

Ammonia

Sulphur dioxide

Ammonia, bromine, hydrogen chloride, hydrogen cyanide

Chlorine

Methane, H<sub>2</sub>S, oxygen deficiency



Pic: Courtesy of Draeger Safety

## HAZARDS AND EFFECTS

Many gases and vapours are toxic, can cause oxygen deficiency or carry the risk of explosion and, as a result can prove to be lethal.

In respiratory terms, different hazards have different effects and are classified as follows:

### ■ Simple Asphyxiants

Inhalation of substances in this category is not usually life-threatening but the presence of a simple asphyxiant can displace oxygen in the air to such an extent that the lack of oxygen can, in itself, be dangerous. Carbon dioxide is a typical example and whilst exposure to low levels can lead to breathlessness, high concentrations can cause loss of consciousness within just 60 seconds.

### ■ Chemical Asphyxiants

Unlike other asphyxiants, these can be immediately dangerous to life and health in that they interfere with the transportation of oxygen within the body. Symptoms following exposure to carbon monoxide and hydrogen sulphide, which is produced by the combustion of polyurethane foams, for instance, include giddiness and headaches before eventual collapse. Exposure to a high concentration of hydrogen

sulphide will cause an immediate paralytic effect on the respiratory system.

### ■ Irritants

Ulceration of the throat, watering eyes, sneezing and coughing are just some of the immediate symptoms that can follow exposure to irritants such as ammonia, chlorine and sulphur dioxide. Where escape is difficult, breathing can become severely restricted and exposure could prove fatal.

### ■ Narcotics

Hallucinations can follow exposure to high concentrations of toluene and other narcotic substances such as tetrachloroethylene.

Combination hazards exist in many situations and, as well as being potentially explosive or flammable in nature can make search and rescue operations very difficult indeed.

## DIFFERENT TYPES OF SYSTEMS

The incident and location will automatically reveal a certain amount of information about the types of hazards that are most likely to be found. However, firefighters entering a potentially hazardous environment need to know exactly which gases are involved there and then, not just for their own safety but for the well being of those they may need to rescue.

Designed to detect airborne substances and to sound a warning if the levels pose a threat to health, portable gas detection instruments can be used to determine if an area is safe to enter, whether it remains safe during rescue or recovery and, after clean-up, can ensure that decontamination has been complete. Whether the hazard is toxic, explosive, combustible, asphyxiating or a combination of any of those, there is an instrument to suit every situation.

### Tubes

Short term tubes provide on-the-spot measurements of targeted gases and are suitable for monitoring personal exposure, spot check measurements, leak checks and confined space investigation. Developed by Draeger in 1937, for example, Draeger Tubes lead the

*Designed to detect airborne substances and to sound a warning if the levels pose a threat to health, portable gas detection instruments can be used to determine if an area is safe to enter, whether it remains safe during rescue or recovery and, after clean-up, can ensure that decontamination has been complete.*

way in tube technology and enable the fast, accurate measurement of over 1000 substances, including chemical warfare agents.

These highly accurate glass tubes can also be used in conjunction with short term pumps to enable rapid measurements to be taken and provide optimum volume and flow specifications. Incorporating automatic stroke counters and a clear end of stroke indicator, pumps require no special tools and give accurate and reproducible results.

Tube technology is also used in the Draeger Chip Measurement System, a portable multi-gas detection system that requires minimal user training and which provides an immediate, true digital readout without the need for further evaluation.



Pic: Courtesy of Draeger Safety

### Personal Single Gas Monitors

These handheld instruments can monitor a broad range of gases and can be supplied with interchangeable sensors to detect specific substances. One such instrument is the cost-effective Draeger microPac Plus. Available in six versions and offering maintenance-free operation, it emits optical, acoustic and vibrating alarms.

Portable instruments of this kind obviously need to be lightweight, easy to read and easy to use, even when wearing gloves and the alarms should be heard, seen or felt in the most arduous of conditions.

### Multi-Gas Measurements

These high performance instruments can be used to measure a wide variety of gases in virtually any situation, from indoor air quality through to confined space entry and the monitoring of landfill gas. The more modern units, such as the Draeger X-am 7000 which can be supplied with a choice of over 25 sensors, can provide continuous detection of up to five gases simultaneously and feature individually adjustable visual and acoustic alarms.

As each sensor is pre-calibrated and is recognised automatically by the instrument, this innovative instrument can be reconfigured simply by changing a sensor and without requiring additional service or maintenance. In addition, the measuring range of these sensors can be changed to any other gas detected by that sensor, by the push of a button and without needing





Pic: Courtesy of Draeger Safety

recalibration. As a result, the accuracy and range of the monitored substance is substantially increased. The search for leaks in flanges, shut off devices and valves, etc., has also been simplified by the addition of a new, flexible gooseneck probe. When in tracking mode, it generates an increasing or decreasing rate of beeps in accordance with the gas concentration detected.

Other specially designed "two-in one" instruments are also available for use where combination hazards involving explosive gases and a lack or surplus of oxygen may exist. For maximum flexibility, the Draeger PacEx2, for instance, can be supplied in two versions: as an instrument for explosive gas measurement, or as a "plug and play", combination instrument for explosive gas and oxygen measurement. Combining extended operational time with minimal training and charging requirements, it features "smart" technology



Pic: Courtesy of Draeger Safety

and is designed to monitor hazard concentrations continuously, simultaneously and independently.

Utilising three functional pushbutton controls, this rugged instrument is operational as soon as the sensors are plugged into the instrument and has a short response time.

Each of these multi-functional instruments can also be fitted with a hose or pump for active sampling in hard to reach areas. Where record keeping is a requirement, they can also be supplied with dataloggers.

Domestic preparedness has come to the fore in recent years, as the dangers of chemical and biological agents have become more of a concern. Providing continuous measurement in real-time, the Draeger Multi-IMS, for example, is easy to use and will quickly detect a wide range of chemical warfare agents. Utilising the latest state-of-the-art handheld detection and monitoring technology, it incorporates a sensor based on Open Loop Ion Mobility Spectrometry and uses an ION Mobility Cell to provide improved sensitivity and selectivity. Concentration, trend and relative dosage measurements are easily taken and a range of graphical alarms indicate both the substance and concentration level as well as the hazard type, i.e. nerve, blister or blood/choking agent. Bar graph displays clearly show the current concentration levels as well as alarm volume and battery status. With a built-in pump and RS232 datalogging interface, it also features audible and visual alarms and an automatic self-check.

Photo ionisation detectors (PID) are perfect for tracing volatile organic

substances in air. Able to detect whole groups of substances, these multi-functional, robust instruments can also be calibrated to monitor individual hazards. Especially useful in confined space measurements and emissions monitoring, they can also assist in fire investigation and in post-accident screening.

### Fixed Gas Detection Systems

Designed to constantly monitor and detect explosive or toxic gases and vapours as well as oxygen deficiency and/or enrichment, these sophisticated systems can be used to sound alarms and initiate evacuation, or to switch off entire processes in the event of a problem. Used to monitor remote areas and/or multiple sites, their data is recorded which means that they can provide valuable incident information before fighters even arrive at the scene.

Providing round the clock protection for, amongst others, the petrochem, food processing and chemical industries, they are also widely used in large commercial sites and sports or leisure venues. Incorporating HART technology, Draeger REGARD controllers, for example, can be used in conjunction with Polytron infra-red, explosion proof and open path transmitters in any application where fail-safe protection is required. Designed for use under the toughest conditions, they are also protected against RFI, high vibration, shock and corrosion.

Firefighters have a need for rapid and accurate information about the nature of the incident. Once armed with the facts, they can respond to the numerous challenges that arise both quickly and competently. Fulfilling a vital role, gas detection systems can be used to eliminate the risks and increase awareness of the dangers.

Further information is available from Richard Beckwith, Draeger Safety UK Limited, Ullswater Close, Kitty Brewster Ind Est., Blyth, Northumberland, NE24 4RG. Tel: 01670 352891. Fax: 01670 356266

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# Elastopipe™ The n



**By Morten Benjaminsen,  
INMACO AS**

Viking, in co-operation with experts from NTNU (Norges teknisk-naturvitenskapelige universitet) in Trondheim and with several oil companies, developed a solution to the problem.

When this accident occurred we had already developed a material that could withstand a normal fire, what we did not have was a product that could take Jet Fire. This was a serious problem for the company because we had nothing to offer to a large market. A typical platform has approximately 30,000 metres of this type of piping, while navy vessels have approximately 3,000 metres.

## 1400°C and not melted, Elastopipe makes Jet fires a less living hell

**MANY WERE SURPRISED WHEN** Trelleborg Viking developed extinguisher and deluge systems using rubber instead of steel piping. However, the scepticism has long gone with good reason.

**A**n Elastopipe system can operate up to 1400°C for 2 hours and continue to function even following explosions and pressure waves.

Steel pipes would be unable to withstand this environment and on a cost basis establishes Elastopipe as a superior product to its competitors.

Elastopipe is becoming an important source of revenue for the Trelleborg Viking rubber factory in Mjøndalen near Drammen and in June 2003 they were awarded an order of NOK 100 mill. with Norsk Hydro for Oseberg Feltcenter.

### Installation without welding

The first offshore installation took place in 1999 on the Ekofisk Tor platform. Phillips performed a gastroscopy check in the spring of 2003 after nearly four year operating time and found so little incrustation in the pipes that the production grooves were still visible.

Trelleborg Viking has installed Elastopipe on a least 50 projects, from a small installation on a coast-guard vessel to a major installation on the Valhall platform.

Additionally Elastopipe can be installed in stave churches and other protected building without the need to weld.

There are many reasons why clients should consider using Elastopipe in fire fighting – and sprinkler systems mainly because it has the ability to resist fire and explosion.

### Jet fires a living hell

The development of Elastopipe began after an explosion following a jet fire on the Piper Alpha platform in 1988. A reason for the large numbers of casualties was the collapse of the fire fighting systems on board.

As a result of this disaster, Trelleborg



### Important co-operation

Trelleborg Viking appreciates the co-operation with NTNU, clients, end-users and sub-suppliers. This co-operation made it possible for us to come up with a solution that made the company more competitive and simultaneously solving a major problem for all concerned.

This co-operation led to Trelleborg Viking designing an advanced xenon lamp used for testing materials during extreme thermal stress. The xenon lamp will reject a jet fire with temperatures up to 1500°C, and because this is so concentrated it is possible to study the actual effect closely to establish smoke development or poison gas.

Another important issue was the development of a rig for testing jet fires. It was possible to hire a unit in the USA or UK, but this was an expensive option, however with our own rig we are now able to test jet fire materials at a fraction of the cost.

The first product made was called Jet-Firestop, a passive fire protector that could be used over existing pipes. This was later developed into Elastopipe by Trelleborg Viking together with oil companies investing NOK 100 mill. We developed a material that behaves like rubber but does not burn. Elastopipe can be used instead of steel or glass fibre, is very flexible, connected with quick couplings in titanium keeping pressure density. No other pipe systems can withstand a jet fire for 2 hours.

### Temperature, corrosion installation

Elastopipe has 3 very important advantages. Firstly it can withstand

# new way of piping

the temperatures during a jet fire. Secondly corrosion is eliminated in connection with sea water through the pipes and thirdly installation is made easier. Iron and steel pipes have to be welded using heavy and expensive flanges – whereas Elastopipe joints are flange free.

Independent analysis show that Elastopipe has a lower operating cost over carbon steel, copper, reinforced glass fibre epoxy and titanium pipe. Carbon steel has the lowest material cost but Elastopipe is more cost effective due to installation, maintenance, operation and safety.

## A patented pipe system

Elastopipe system is a new and patented pipe system developed for fire fighting and deluge in exposed areas/environments. It is designed in a synthetic and flexible rubber, replacing pipes made from steel, titanium or glass fibre. The system has been tested and approved for an explosive scenario followed by impact and jet fire. Physical testing has proved that no metal or epoxy pipe will withstand this treatment.

Third party system approvals include DNV and ABS.

Trelleborg Viking AS manufactures Elastopipe™ from 1" to 8" in diameter including reels up to 40 metres.

The system has a number of unique qualities:

- No corrosion
- Flexible system
- Withstand jet fires
- Easy installation without welding
- Minimize waterhammer
- Withstands impact
- Low maintenance

INMACO is a distributor and agent of Elastopipe. For more details please see our web site which includes images and videos or contact:

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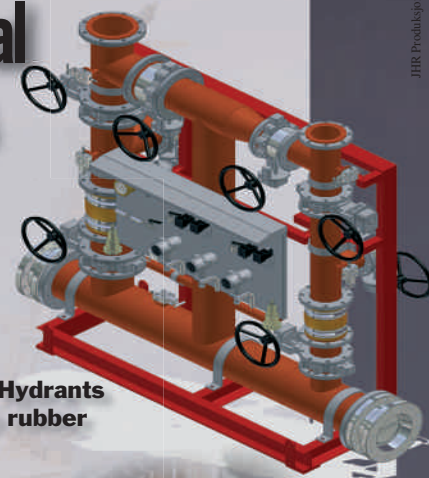
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# Firefighting Foams

By Dave Cochran



Picture courtesy of Hale Products, Inc.

AS ONE MIGHT GUESS, with the environmental issues of today's times there are some new innovations of foam concentrates available to the world. This article will attempt to address some of these which hopefully will assist those in the need to reach a conclusion as to what they will require when the need arises for them to make a decision.

In addition, we will also discuss those that have been around and are still available. No efforts to sell or give the manufacturers names will be made here. Should you desire information you may contact the magazine or go to the internet and research the various manufacturers, or go to Underwriters Laboratories to obtain listings and manufacturers.

Firefighting foam concentrates have existed since the late 1800's for handling both flammable and combustible liquids. Initially the foams were chemically introduced through a mixer by pouring the two powdered chemicals into a hopper where it was mixed with water becoming a foam water solution and carried to the fire by hose line. When it reached the delivery device air was introduced and expanded the solution into a light weight bubbly foam bubble. This was very time consuming, and required the handling of 5 gallon containers and required a lot of manpower. With the size of the storage tanks growing to jumbo diameters and heights there is no way this type system could exist today. There are some still in existence but it

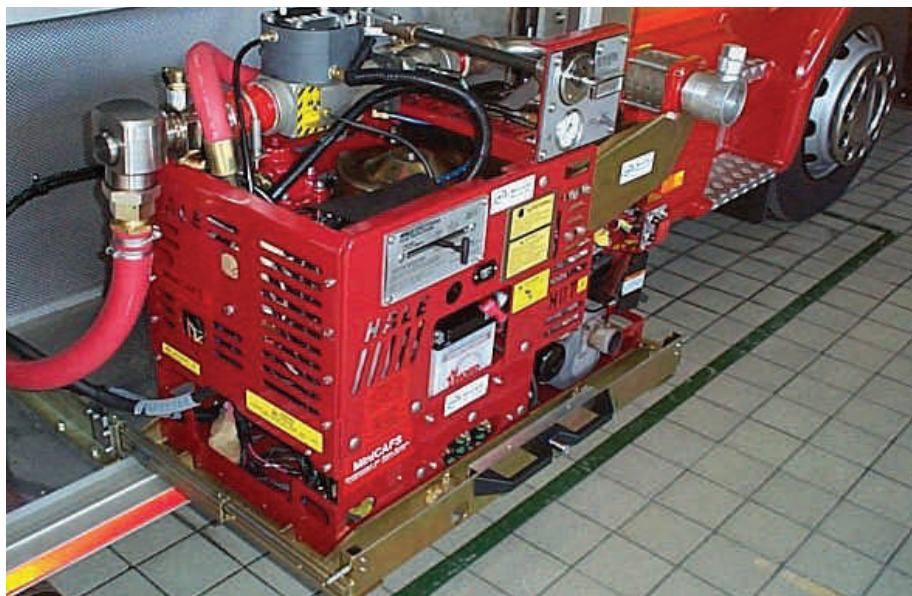
is not known if they are in a functional state.

Foam systems consist of foam concentrate, proportioning device, water supply and foam maker(s). All components are important, but the concentrate is the most important of any system. We will discuss the many types of foam concentrates that are currently available.

## PROTEIN FOAM

Protein foam concentrates have been around for many years. They are manufactured from protein hydrolysate, foam stabilization compounds, freezing point depressants and preservatives. These are blended together to produce homogeneous, highly stable foam concentrate. These foams are designed to work on flammable liquid fires using only aspirated foam nozzles and foam chambers. They will not work with non aspirating nozzles. They can be used with both fresh and seawater.

They are not approved for use



Picture courtesy of Hale Products, Inc.





Picture courtesy of Hale Europe

through subsurface injection equipment or for use on polar solvents and are not compatible with dry chemicals.

#### FLUORPROTEIN CONCENTRATES

In addition to the protein materials, fluorosurfactants are added which allows for more extinguishment capability, more fluidity (allows it to move faster and move around objects), is compatible with dry chemical, and gives superior sealability and burnback resistance. Because of its resistance to fuel pickup, fluoroprotein concentrates are capable of being used for subsurface injection. They are for use on hydrocarbon fires only, and, like the protein foams must be used through aspirated equipment. They can not be used through non-aspirating equipment. They can be used with fresh and seawater.

#### SYNTHETIC FOAM CONCENTRATES

AFFF synthetic foam concentrates were developed in the 1960's for use by the U.S. Navy. The obvious need was for fast attacks and rescue of pilots both on shipboard and land. Fluorocarbon surfactants and synthetic foaming agents were added which produced an aqueous film. This thin layer of foam solution spreads rapidly across the surface of most hydrocarbon fuels which gives a rapid knockdown of fire. This



Picture courtesy of Hale Products, Inc.

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# Concentrate on foam; we do.

## Protein Fire Fighting Foams

Choosing the right foam concentrate for your particular application can be a bewildering process due to the wide variety of products available in the market. So how can you be certain to make the right choice? You buy from a reputable manufacturer with the experience and expertise to deliver reliable fire protection products to a market that demands the best. You can be certain if, when you need a protein based foam agent, you choose Sabo Foam.

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became, and still is, the norm for crash rescue firefighting. The aqueous film is created by the action of the fluoro-carbon surfactant reducing the surface tension of the foam solution that is supported by the hydrocarbon fuel.

This type of concentrate can be used through low energy producing equipment and produce good quality foam. Non aspirating nozzles can be utilized with this type of concentrate and the bubble is produced as the stream is being thrown to the fire. This allows for expansion ratios of somewhere 3-4 to one. If used through aspirating equipment, the expansion is increased to in excess of 5 to 1 the extinguishment is faster and offers better burnback resistance. These concentrates can be used with both fresh and seawater.

#### ALCOHOL RESISTANT CONCENTRATES

Polar solvent products such as alcohols are very destructive to those foam concentrates which are considered conventional products. The polar solvents extract the water from the foam thus destroying the foam blanket very rapidly. In order for foam concentrates to perform on polar solvents, a polymer was added that will form a polymeric membrane between the fuel and the foam blanket. This membrane can be seen when placed on polar solvent fuels. Because of its versatility, when different fuel types are present these type concentrates are purchased to allow for more efficient operations, and permitting the use of one concentrate for a variety of different products. These concentrates are capable of being used with both aspirating and non aspirating equipment. Both fresh and seawater can be used with these concentrates.

#### 3% X 3% CONCENTRATES

The next generation of foam concentrate to be introduced is one that requires a 3% proportioning ration on both hydrocarbons and polar solvents. This type of concentrate has a special biosynthesized polymer which fills two functions, the first of which forms a membrane between the fuel and the foam blanket. This is the same as that of the 3% x 6% concentrate. The second function makes the foam more stable and heat resistant which gives it better



Picture courtesy of Hale Europe

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burnback resistance and the ability to seal against hot surfaces. Like the other concentrates it can be used with both sea and fresh water.

#### 1% X 3% CONCENTRATES

1% x 3% foam concentrates for large storage tank firefighting were introduced about 1990/91. This concentrate can be proportioned at 1% on hydrocarbons and 3% on polar solvents. It is claimed these concentrates, at the 1% rate contain much more chemical than the other multi purpose foam concentrates, which means more extinguishing agent is put onto each square foot of the liquid surface. It is suggested you contact your manufacturer for information regarding these concentrates for tank fire situations.

#### SPECIAL CONCENTRATES

A new innovation of foam concentrate that contain microbes is now available for firefighting and spill control. The purpose of the microbes is to begin to digest the fuel being combated. In spill, or "skin", or levels that are rather thin as far as depth is concerned, two (2) inches or less, the microbes will ingest hydrocarbon fuels and will, over time, digest the fuel. These microbes are specifically selected and adapted for this service and biodegrade in 23 days. The company manufactures both a class A and Class B concentrate including a 3x3 AFFF Alcohol Resistant Concentrate, and a AFFF Concentrate. On fires involving in depth situations, it would take forever for the fuel to be



*Large capacity aspirated foam Monitors like Colossus are ideally suited for efficient use of foams like FP70 Plus onto large tank fires*

digested, but, according to the manufacturer, the LEL is quickly lowered, thus reducing the hazard level. In addition, this concentrate is also biodegradable and the microbes will also digest the finished foam, regardless of the type, thus reducing the clean up cost.

#### CLASS A CONCENTRATES

Most foam concentrate manufacturers make class A foam concentrates for use in structural firefighting operations. Some of these available can also be used on thin layered flammable liquid situations. As in the special concentrates previously mentioned, one of these also contains microbes, is biodegradable, has a strong penetrating effect, and is highly effective according to the manufacturer. Many of these are available.

#### GELS

There are several agents available that are termed to be Gels. What this means is they can be applied to buildings for example, in the case of a fast advancing forest fire, homes can be sprayed to prevent them from being destroyed in the ensuing fire.

#### RECOMMENDATIONS

It is highly recommended any organization interested in purchasing firefighting foam concentrates, should contact the testing organizations such as Underwriters Laboratories, Factory Mutual, USCG, US Navy, USDA, MOD, ICAL, ICAA, ISO, EN, etc., for information concerning a product(s) you may be interested in purchasing. I would not always trust the word of a salesperson, unless they are well known to you and reputable.

In addition, the proportioning equipment you are using should be tested and well maintained. When you get down to the 1% concentrates, there is little room for error on the low side. If they proportion on the rich side you are probably going to be OK. Other than causing the cost per gallon to increase you will be on the safe side and will perhaps be successful in your attempt to extinguish, or prevent ignition if that is the situation in which you are involved.



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# FSI Cold Plasma Ionization



FSI F-MAP

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combination simultaneously.

But FSI is not content with resting on its' laurels as it were. FSI is working hard to meet the increasingly sophisticated demands of the market place — demands that today require fully integrated systems and larger and more personnel handling capabilities.

And one such leading edge product shown represents the very future of decon — that being the F-MAP cold plasma ionization system.

Current technology largely employs the use of copious quantities of water and/or detergent or both to decontaminate victims and first responders.

The FSI F-MAP cold plasma ionization system represents the future of Hazmat Decontamination.

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- d. 'hydroxyls' (the component in misted hydrogen peroxide that actually kills bio/chem. 'nasties') and these:



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- e. short lived (10's of seconds maximum) 'hydroxyls' are then pushed at high speed thru ducting into:
- f. FSI shower/shelter systems where people awaiting decontamination:
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\*For a human to survive Vx nerve gas exposure the 'kill' ratio must be in very short order from the time of exposure to at least 5 logs of 'kill'. To ensure no long term damage the 'kill' ratio must be to 7 logs on Anthrax, Small Pox and other Biological Agents. Lesser Bio. Chem. agents are killed to more than 7 logs. The F-MAP system will work on all known Bio Chem. agents.

The F-MAP system represents years of work, research, and millions of dollars spent by DOD and the US Army and clearly shows a finished, approved and viable product, available only from FSI in this format.

In the future FSI decon shower systems may well increasingly employ this technology, and eventually water decontamination will become a thing of the past.



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# Fuel Spills a



Taken during the initial explosion

THE EVENTS OF THESE scenarios are being written to the best memory available. Some discrepancies may be evident, but this does reflect pretty close to the actual event.

## SCENARIO I

Imagine you have a lake tanker loaded with unleaded gasoline, tied to a dock at a terminal. This terminal is located on a major waterway that feeds a very large Great Lake. Both the lake and river are tidal, and are used by boaters for recreation—heavily in the summer because ice envelopes the waters in the winter. It is early September and the boating weather is fast coming to a close. The vessel suddenly breaks away from the dock, rupturing its fuel line feeding a tank in the terminal, creating an explosion and fire on the boat and in the river. Several of the vessels fuel tanks are breached creating a large fire on board. Fortunately only one death

occurred—because the person could not swim. The first due fire department responded with mutual aid and did a fantastic job in preventing damage to the terminal or surrounding exposures.

Because they did not have the wherewithal to combat the vessel fire, which included large supplies of foam concentrates, the vessel owner contacted a professional firefighting company to come in and handle the situation.

The ship was during low tide awash in some areas, thus permitting the gasoline to float into the river. Every agency with any responsibility with fire, emergency, environmental, or any other concern was on the scene for the duration. Meetings were in constant demand as one could imagine. The fire

By Dave Cochran

occurred in the mid morning, on a Saturday in early September. The contract firefighters arrived at approximately 2300 hours of the same day. While nearing the scene on a charter aircraft, a flyover was requested, but denied by the FAA. The crew landed and went immediately to the scene, but, because the equipment such as foam, delivery devices, pumps, hose, etc. would not be on the scene until the next morning, they went to a hotel and rested for the night. The next morning, a Coast Guard Buoy tender was utilized as a firefighting platform, and once the C-130 had arrived with the firefighting equipment. A fork lift and flatbed truck met the aircraft, loaded the equipment and went to the dock to off load onto the buoy tender. Once this was completed, the vessel left the dock, travel approximately  $\frac{1}{2}$  to  $\frac{3}{4}$  of a mile up river, pulled alongside the damaged vessel, and firefighting efforts began. In approximately 1 hour the fire was

*Every agency with any responsibility with fire, emergency, environmental, or any other concern was on the scene for the duration.*



Foam supply boat approaching the fire fighting vessel. Note the foam blanket

# nd Clean Up

extinguished, and mop up and over haul operations began. The firefighters boarded the vessel using portable extinguishers to extinguish spot fires and sledge hammers to knock carbon off the overheads into the liquid to prevent later fires from occurring. Periodic foam applications were made to prevent ignition. Late that night, with the knowledge the fire would flare up, left and went back to the hotel for a well deserved rest. On arrival the next morning, a fire was in evidence, but quickly extinguished when the coast guard vessel again pulled alongside.

From this time on, overhaul was the only action required.

The vessel owner hired the firefighters to remain on the scene until the vessel was safe for towing. A tug boat and barge were hired to use as a working vessel and tied up along side the ship. The tug and its crew supplied the logistics as far as food, quarters, and work platform.

Periodic foam applications were made to prevent ignition while the product was pumped from the ship to the shore into portable tanks and trucks for delivery to a storage location.

The river was boomed from shore line to shore line both above and below the vessel covering approximately 300 yards of the river between the upper and lower booms. Finished foam was very evident the entire time of the operation between the booms. The entire area was patrolled several times a day by the Game & Fish people, EPA, and other interested parties, with soil, water, and dead or injured animal or bird searches being conducted.

To the best of my recollection there was only one fish found to be dead, and that was caused by the concussion when the explosion took place.

Environmentally, this operation was a total success. The water treatment



*Foam being applied to the fire. The foam blanket is obvious*

facility which was located in this area did experience a problem with some foaming taking place.

Should the operation involve crude oil from a disabled vessel, if possible, the area around the vessel should be boomed off to prevent the oil from drifting off with the tides and wave action. Obviously this should be done as quickly as possible. Bear in mind, wave action may prevent the boom operation as well as prevent any spilled oil from being captured within the perimeter of the vessel-obviously if this happens the oil will drift with the wind and currents for miles.

In addition, consider hiring barge companies with the capacity to take on any water, product, or any other residues from the endangered vessel. The capturing of any thing being discharged from the vessel will be paramount to not only a safe environment,

but from an environmental view point as well.

## SCENARIO II

A large super tanker is anchored about 100 miles off shore. A fire developed in the engine room which caused the death of one crewman. The fire was fought for a number of days by different organizations, which created a very large crude oil spill into the waterway. This spill moved with the tides and winds for several days creating an environmental situation that was not under control by any means. The stern of the vessel was awash, creating the spill. The helicopter and other air traffic was so heavy, air traffic controllers were brought from the FAA center to control the traffic. Little effort was made to enter the engine room, to make extinguishment using hand lines, and to conserve water and foam application.



*The stern is awash allowing crude oil to enter the water*





Fireboat in position applying cooling water to the stern

The initial extinguishment efforts were made by both a sales oriented company and a company not experienced in shipboard firefighting. This situation created much controversy because a firefighting organization was brought in from Europe to combat the situation. Further delay was created when pumps and other equipment were flown in from outside the United States, when with a little effort and pre planning, sufficient equipment was located but a little more than a 100 miles away. Forget the fact the firefighting expertise was also available, but it is obviously takes more time to load equipment onto aircraft that is capable to haul such big heavy and hard to maneuver pieces of firefighting gear.

The controversy lasted several days, with many interviews and became national news on some networks. Locally this made, as one can imagine, headlines daily during the duration.

#### RECOMMENDATIONS

Pre planning is a must when heavy vessel traffic is the norm. The U.S. Coast Guard has taken steps for handling such events. In addition, if you are with an organization that is subject to become involved in these situations, it is imperative you work closely with them.

Establish communication with tug boat, barge, workboat, helicopter and



Stern awash and white smoke showing indicating establishment of some control of the situation

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*The controversy lasted several days, with many interviews and became national news on some networks.*

other organizations that you will need to utilize if and when the event may occur.

Even though control of the fire or other emergency is paramount to success, the use of barge(s) in which to off load cargo such as crude oil, foam and water may be required to prevent spills to the water way. Environmental issues will fast become of the utmost in importance. The EPA or whatever the environmental responsible may be called in various parts of the world will certainly become involved to oversee the situation. Be prepared to work closely with these and other related organizations. Having heard some responsible leaders of emergency organizations state they have no concern with anything but remediation of the situation, I assure you, when the time comes, they will quickly change their mind.

Large industrial waterways such as the Houston Ships channel, Delaware and Mississippi rivers have been shut down for days, and in some cases weeks because of incidents involving marine vessel situations. This creates not only problems locally, but also to the many vessels that must be held up from making much needed delivery of bulk, petroleum, and many other necessary products to ports around the world. These vessels cost thousands of dollars per day when kept at anchor waiting to reach the dock.

Be prepared and start today to be ready when the call comes. You will not regret the success and pride you will feel once you have been involved in these situations.



Air traffic controllers at work during the situation




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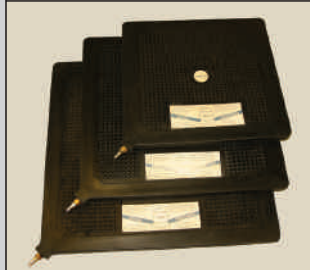
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PRODUCT RANGE

# Large-scale Storage Tank Fire Fighting

By Mike Willson  
of Angus Fire

Colossus monitor in action on hydrocarbon tank fire in Middle East

**BULK STORAGE TANK FIRES** are amongst the most difficult flammable liquid fires that professional firefighters can face. Not only are they huge in area, but also very hot, often burning for hours or even days before resources can be marshalled to launch a foam attack.

## FIXED SYSTEMS PROVIDE SIMPLEST ANSWER

The easiest and most reliable way to protect bulk storage tanks is with a well designed and properly maintained, fixed foam system that will take a prescribed course of action to quickly deliver foam onto the tank. This can be through well designed top pouring, rimseal or base injection equipment depending on the contents and tank design. These systems can be automated using linear heat detection or alternative heat sensing devices. These detect the fire and automatically activate the foam systems through actuated valves and pipework systems that divert foam to the relevant tank from a centralised storage and proportioning system.

Whilst this is the preferred and most effective method of protecting bulk storage tanks, there are many storage

tanks where no such systems have been fitted. Some systems can be retro-fitted to such tanks, but many installations rely on mobile monitors to provide a more flexible solution. These can be set up and used on any of the tanks in the tank farm or adjacent areas. While this is often regarded as more cost-effective,

it often requires more expertise to operate effectively and more financial and time investment during the fire.

## SURROUND AND DROWN METHOD OUTDATED

The old style “surround and drown” approach involves several small flow monitors around the tank projecting foam into the tank. This has been shown to be outdated, labour intensive and not as efficient as the modern and now widely accepted large capacity monitor strategy.

*The easiest and most reliable way to protect bulk storage tanks is with a well designed and properly maintained, fixed foam system that will take a prescribed course of action to quickly deliver foam onto the tank.*



# Large-scale Storage Tank Fire Fighting

## LARGE CAPACITY MONITORS ARE WAY FORWARD

Modern firefighters have shown that one or two large capacity monitors of typical capacity 15,000 litres/minute capacity and upwards offer the best answer.

It works by delivering a locally high application rate of foam into the “wind tunnel” around the periphery of the tank where air is drawn down onto the fuel surface to sustain the fire. This enables the foam to establish a bridge-

head against the fire from which it can spread out and seal against the tank shell. The average size for bulk hydrocarbon storage tanks is about 60-75 metres in diameter, with the biggest being a colossal 110m (360 ft) diameter with a huge 9,500m<sup>2</sup> surface area – more than two football pitches! Special measures need to be taken to enable such monitors to tackle such a blaze.

## FLUOROPROTEINS THE FOAM OF CHOICE

Modern high performance FluoroProtein foams like FP70 Plus are the most cost

effective answer for storage tank fire fighting. This has been clearly demonstrated against the oil industry's own specialised LASTFIRE test for this application, often exceeding the performance of more expensive AR-AFFF type foams.

## LOGISTICS IS THE KEY

When large capacity monitors are being used it is vitally important to ensure the supply logistics are kept simple and quick. Fast response logistics is the key to getting foam onto the tank quickly and effectively.

High performance large diameter 150, 200, 250 and 300mm (6"-12") high volume (Hi-Vol) layflat hoses play a crucial role in minimising the number of hose lays. These reduce time delays, pressure losses and the confusing “spaghetti effect” of using too many small diameter hoses.

Hi-Vol hose swells slightly when pressurised. This minimises the pressure losses from the ring main system to the monitor, crucial in achieving efficient and effective foam delivery onto the tank.

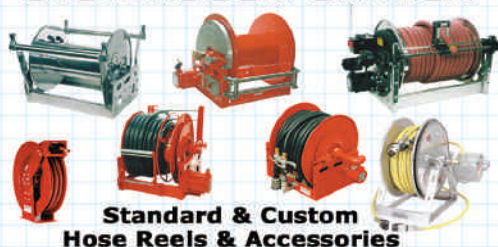
Adequate water pressure is one of the key elements that can make the difference between success or failure in a monitor attack. Providing large diameter outlets from the ring main also avoids any restrictions before water flows through the Hi-Vol hose system to the large capacity monitor. This is essential in achieving an efficient systems and increases your likelihood of success.

## RAPID DEPLOYMENT AND EFFICIENT RETRIEVAL

Hi-Vol hose is heavy compared to regular 52mm or 65mm dia. attack hoses so a simple, reliable and effective deploy-

*When large capacity monitors are being used it is vitally important to ensure the supply logistics are kept simple and quick. Fast response logistics is the key to getting foam onto the tank quickly and effectively.*

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ment and retrieval system is required to take the back-ache out of handling it. Fast and Efficient Techniques for Collecting Hi-Vol (FETCH) are now available as self contained modules with their own hydraulic power packs. They can be built-in to new fire truck builds or retro-fitted into existing vehicles for a more cost-effective solution. They also enable rapid retrieval of Hi-Vol hose, once an incident or training exercise is over – crucial for tired firefighters.

#### NOZZLE OR CANNON?

One dilemma facing firefighters is whether to try and throw the foam as far as possible accepting the foam quality is not as good, or to use up more pressure to make a good quality foam but find it will not reach the tank.

The foam delivered must be sufficiently robust and stable to penetrate the flames, withstand the intense



15,000L/min Colossus monitor for tank firefighting



Hi-Vol avoids the problems off the spaghetti effect

radiant heat from the flaming surface and cherry red tank shell, yet progressively control the fire. This means a well aspirated low expansion foam blanket.

Leading manufacturers are able to find an effective compromise where adequate foam quality and throw distance are achieved either with a semi-aspirated nozzle or with an aspirating cannon providing a more stable foam blanket.

Both nozzle types are represented in the LASTFIRE test and both work well. However, foams produced using the

aspirated cannon type nozzle usually exhibit better foam quality which helps minimise plunging into the fuel. This reduces the fuel pick-up by the foam blanket, so the foam is more effective with less wastage. There is also less risk of flaring and flashover once the fire is extinguished that could be responsible for major re-involvement from hot metal or incandescent seal materials. The synthetic detergent based foams are more prone to this problem as they emulsify more readily when mixed with hydrocarbon fuels.

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# Large-scale Storage Tank Fire Fighting



*FETCH in action taking the back-ache out of hose deployment and retrieval*

## SINGLE PROPORTIONING MORE EFFICIENT

Having a single jet pump inductor or diesel driven foam pump hastens deployment of the monitor and ensure foam of the correct quality is produced. Trying to balance and bring on-stream several inductors or jet ratio controllers inevitably introduces delays and wastage of foam before any real impact can be made on the tank fire.

## CONCLUSIONS

Consideration should be given to fixed foam systems to quickly take a prescribed course of action for rapid control of tank fires. Where this is impossible, well designed large capacity monitors should be chosen. Independent fire tests have shown that aspirating cannons will provide foam of a quality most likely to put the fire out and keep it out, especially when high performance FluoroProtein foams are used with associated cost benefits.

The hose system configuration selected to connect these monitors to the ring main or pumping systems is crucial and could well determine success or failure of the foam attack.

Efficient and effective modular Hi-Vol deployment and retrieval systems are necessary to provide fast response to the incident and enable foam to be delivered quickly onto the fire.

Logistics of the entire large capacity monitor package and regular training to ensure everyone knows how it all works is your key to success.

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# Fire and Rescue Training





# A world force in fire



Pic courtesy of The Fire Service College



IF SOMEONE WERE TO mention to you there is a College dedicated to worldwide fire service development, that has a 30 year pedigree, has trained to date over 300,000 fire personnel globally, is set in a 550 acre site and almost certainly offers the most extensive range of fire training and consulting products available – who would you say it was? You've probably guessed already – The Fire Service College.

Over its history, the College based at Moreton-in-Marsh, Gloucestershire in the UK, has been at the forefront of innovation, whether it is the recent move into USAR and new dimension training, the latest thinking on fire engineering and safety, or the continual updating of its rigs and courses designed to develop operational command techniques and bring about the effective management of incidents at all levels. Today, the College even works as a consultant, advising clients on how to improve the performance of their fire service or fire operation.

Whether you work in one of the many fire services spread across the globe, hold fire responsibilities in business and industry (petrochemical, hazardous goods, manufacturing etc), or have an emergency management or fire safety role, the College can design programmes to develop you and your organisation. It can even bring its expertise to you, outside the UK, in the form of outreach programmes, covering all areas of its operation. The College

sums up its credentials simply – Unrivalled Experience, Unequalled Expertise.

Keith Glanfield, Sales & Marketing Director at the College, gives his



Pic courtesy of The Fire Service College

view on what sets it apart: “The College has the unique ability to advise on most, if not all aspects of the fire environment and the effective operation of fire organisations. In addition to providing cutting edge training, the College can also benchmark organisations against internationally recognised standards, design and recommend strategic improvement plans and even manage the implementation of the resultant change programmes. We are an organisation geared to driving operational improvement for all our clients.”

## UNPARALLELED RESOURCES

Just imagine a day-to-day incident that needs sound theory and plenty of practice to get your response right each and every time. Or imagine the unthinkable, that might never happen but could, a major incident where it is essential to scope out incident plans, train people in their implementation, and practise to get it right.

Imagine what could be achieved if you had all of this at your disposal:

- M96 Motorway Training Area
- Oil Rig Simulator
- Large Tank Simulator
- Aircraft Simulators
- High Rise Simulator
- Helicopter Simulators
- Urban Search and Rescue (USAR) Training Complex
- Breathing Apparatus Training Complex
- Industrial Factory Training Complex
- Road Traffic Accident Complex
- Rail Accident Complex
- Aviation Training Unit
- Ship and Marine Training Area

These resources, accompanied by the College's knowledge of best operating practice and its virtual reality simulator, can be combined to design a programme specific to each client and their own individual requirements.

# service development

Peter Mansfield, a tutor for International and Wider Markets says: "We can replicate almost anything. Our scenarios are very realistic, yet there's a high degree of safety and control. We have about six buildings that we can set fire to and a couple we can smoke up. There are aircraft that we can set up for various kinds of fire and rescue simulations, as well as an oil rig and a ship, which is made out of concrete so we're never going to sink it! We have a motorway here, which we can set up with cars and lorries, a railway track and level crossing, a roundabout, plus perimeter and access roads that we also use for training."

Recent additions to the vast Incident Ground include three large indoor training rigs for practising tunnel-based search and rescue, breaking and breaching skills and working in multi-level collapsed buildings. The entire training environment is supported by a comprehensive, state-of-the-art fleet of rescue vehicles and equipment. It even has resident rescue dogs, trained by the United Kingdom Fire Services Search and Rescue Team (UKFSSART).

## UNEQUALLED EXPERTISE

To match the extent of the College's practical resources, it also provides a wealth of expertise and knowledge, with a tutor base that has an insight into the practical application of both general and essential concepts down to individual specialised areas.

Take, for example, fire engineering and fire safety where specialisms are covered in great depth, including fire investigation, industrial and domestic fire protection systems, high life building risks, building regulations and even smoke control. These as well as the more general foundations of fire safety, fire risk assessment and fire legislation, are blended together for each client. So whether it is a requirement for training in Malaysia, Hong Kong or Spain, for experienced or inexperienced practi-



*Pic courtesy of The Fire Service College*

tioners, with general or specific needs, a programme is tailored to meet all these requirements.

The practical emphasis of the College's approach to learning and development comes with its aim to ensure that the training provided can be immediately applied once back in the workplace. This is because it is delivered by leading professionals drawn from fire and rescue services throughout the UK, and guarantees training is as up-to-date as it is hands-on, applying equally to all subject areas on offer:

- Incident Command and Management
- Urban Search and Rescue (USAR)
- Multi-agency Training
- Hazardous Materials
- Rescue
- Industrial Firefighting
- Aircraft Rescue and Firefighting
- Marine Firefighting
- Off-shore Firefighting
- Firefighter Development Training
- Fire Safety and Engineering
- Specialty Courses and Customised Training Programmes
- Instructor Courses



*Pic courtesy of The Fire Service College*





*Pic courtesy of The Fire Service College*

Peter comments: "We work with local authority fire & rescue services, industrial fire brigades, works fire brigades, chemical decontamination teams, emergency response teams, and we've organised training for the police as well. Several weeks of the year we do courses for the Dutch emergency services – police, fire and ambulance all training together. We also run other overseas courses here, including breathing apparatus, road traffic accident, fire behaviour and tactical ventilation instructor courses. These take place every year in addition to our normal courses for the UK Fire & Rescue Service."

#### RESPONDING TO NEW THREATS

Since the events of September 11th, fire services, civil defence forces and fire

organisations across the world are having to re-examine the traditional ways of doing things to see how they match up to the new demands placed on them by a changing world. Often this requires reviewing how effective they are at command and control, operational mobilisation and resource management, together with their operations that prevent fire and support core activities (procurement, finance and IT etc). This is a complex and time consuming task, which is the reason why the College has recently been asked to undertake this type of study for several clients.

Keith comments: "We can take all the best operating practice we have accumulated from across the world and in the UK and apply it to a fire organisation. By benchmarking an organisation's performance, to a set of agreed standards linked to the local operating conditions, we show where improvements can be achieved and give firm recommendations on how this can be done. According to the needs of the client we can provide a range of outcomes from the study ranging from a detailed training needs analysis through to a change management programme to take it to a new level of improved performance. The College can even assist in implementing these changes."

This is an added dimension, which can be taken to any

corner of the world and adapted to provide almost instant improvements in the operation of fire organisations.

#### GLOBAL REACH

A significant proportion of the College's activity is taken directly to the client throughout the UK and overseas with the outreach programme. The Fire Service College visits clients on their own sites, using the equipment they use every day, working in their local environment. Exercises, case studies and simulations can be tailored to specific practices, with each programme designed uniquely to the client's organisation.

The popularity of this form of training delivery has resulted in the College building an international customer base that spans Europe, the Middle East, North Africa, South East Asia and the Caribbean. Equally there is still a demand for international customers to visit Moreton-in-Marsh and take advantage of its unique facilities, learning alongside the College's UK delegates.

Regardless of whether training is delivered via outreach or through clients coming to the College, it is keen to keep in touch offering ongoing help and support. Keith concludes: "Training and consultancy is a two way street – whether it's a new development, a fresh insight or an operational improvement, we are keen to promote the sharing of best practice and the continuous raising of standards for the College and its clients."

**The Fire Service College – Unrivalled Experience, Unequalled Expertise.**

For further information,  
please contact:

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*Pic courtesy of The Fire Service College*



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# Basics = Success in



Pic: Courtesy of E.S.T.I.

**WHAT IS VEHICLE EXTRICATION REALLY ABOUT?** We could all define vehicle extrication and most of our definitions would probably read something like, "Vehicle extrication is the process of removing the vehicle from around an occupant or occupants." Incident Commanders and Training Officers will have a significantly different focus to their thoughts about vehicle extrication, though. When most of us think about vehicle extrication we normally think about the tools associated with the operation, but vehicle extrication is more complicated than a set of tools and their use, and we need other skills and knowledge to be successful in such operations.

**T**raining officers must identify a series of incremental steps that contribute to vehicle extrication, and they must provide training that adequately equips their department personnel to perform each of those steps safely and efficiently. Many fire departments do not have the budgets or resources to train all of their personnel on each aspect of vehicle extrication. Where then do you start, and how can you provide sufficient training with limited time, budgets, and people?

## Basics! Basics! and Basics!

Vehicle extrication is nothing new to the fire service, but it has evolved into something that is more time consum-

ing than it was many years ago. Some of the areas in which personnel need more training include vehicle design, scene size-up, scene safety, apparatus

**By Paul Gunnels**  
**Lieutenant Paramedic –**  
**College Station Fire**  
**Department,**  
**Rescue Adjunct**  
**Instructor – TEEX,**  
**Rescue Specialist – Texas**  
**Task Force #1**

placement, and tool familiarization. As we focus on these areas, we will take a look at the fundamentals of each. The basics are important, because this is the foundation that we will build upon during every emergency operation. Building a solid foundation provides us the keys to success.

## VEHICLE DESIGN

The basic principles of vehicle extrication have for the most part remained the same over the years, but vehicle design has changed in order to provide better protection to occupants as well as for aesthetic reasons. Many of us believe that the new safety designs in vehicles have increased the safety of occupants, but those same safety features may have serious implications for emergency responders during vehicle extrication operations. Consider the example of air bags, which are a safety feature in newer vehicles designed to offer protection to vehicle occupants at

*The basics are important, because this is the foundation that we will build upon during every emergency operation. Building a solid foundation provides us the keys to success.*

# Vehicle Extrication

the moment of impact. This same safety feature becomes a hazard to occupants and emergency responders alike *after* an accident, when their detonation becomes a potentially harmful risk during extrication operations.

Emergency responders training on vehicle familiarization will improve their knowledge about vehicle design and safety features before responding to an actual emergency. When developing this type of training, stay focused on the basic structural component terminology while learning the location of fuel lines, the battery, air bags and roll-over protection devices, and so on. A valuable resource for this type of information is your local car dealer. Consider contacting local dealerships and ask the general managers if they can accommodate your needs for training and information – you may be surprised by the amount of information their mechanics and sales staff can provide about the construction of their vehicles. Remember, of course, that dealers generally specialize in a few makes and models, so you may have to visit several to get a comprehensive understanding of the latest car designs. Several reference books provide further information of value to emergency responders; one example is the latest edition of Ronald E. Moore's *Vehicle Rescue and Extrication*.

## SCENE SIZE-UP

Scene size-up starts at the beginning of the call and is re-evaluated and reassessed throughout the incident. As a Company Officer responding to the scene of an accident, one of your first responsibilities is to determine the number of patients, their condition, and whether or not extrication operations are necessary to remove them from their vehicles. When arriving on-scene, it imperative to identify any hazards such as leaking fuels, electrical wires, traffic conditions, and anything else that could endanger emergency responders and victims. After identifying possible hazards, take appropriate



Pic: Courtesy of E.S.T.I.

action to minimize or confine the hazard. Having adequate resources on the scene or en-route to handle the incident can improve patient care and increase on-scene safety. During my career, I have been taught that it is imperative to have adequate resources on-scene in a timely manner. It is always better to call early for resources and send them back if you don't need them than to need them and not have them at the ready.

## SCENE SAFETY

Scene safety is important to the well-being of all emergency responders and the patients on scene. Basic scene safety begins by wearing the proper PPE while on-scene at any roadway accident. The impulse to activate operations quickly, followed by the need for concentration during operations, can easily lead to tunnel vision, obscuring our perception of secondary hazards.

*When arriving on-scene, it imperative to identify any hazards such as leaking fuels, electrical wires, traffic conditions, and anything else that could endanger emergency responders and victims.*



## Basics = Success in Vehicle Extrication

Scene safety is the responsibility of every emergency responder and we must recognize that after all efforts we still are not guaranteed not to find ourselves in unforeseen and dangerous situations. We hear too often about firefighters who have been injured or killed while working a roadway accident, and these types of accidents seem to be occurring more and more frequently in recent years. Just this week I received an e-mail from the Secret List at [firefighterclosecalls.com](http://firefighterclosecalls.com) informing me about another roadway accident involving emergency responders. Three firefighters and two medics working a roadway accident in Ft. Worth were injured when a passing vehicle hydroplaned and struck a vehicle from the first accident. All five emergency responders received non-life threatening injuries due to the accident. We always think it will happen elsewhere, but these accidents can happen at any time within our own organization.

Many unpredictable and everyday factors increase our risk of injury while on roadways, including weather, road conditions, time of day, and location of the incident. These factors are out of our control, but we can take steps to reduce our risk levels. Wearing a highly visible reflective vest can improve our safety. Vests conforming to the American National Standards Institute (ANSI) for Class 3 are designed with emergency responders in mind; such vests are designed for personnel working around traffic that exceeds 50 mph and in poor visibility due to inclement weather or nighttime operations. These vests are relatively inexpensive and can improve our ability to be seen while on roadway incidents; they should be worn by all emergency responders who are not wearing turn out gear. Wearing

vests gives an added degree of safety during roadway operations while having no impact on the operations themselves.

### APPARATUS PLACEMENT

While on roadways, apparatus placement is a key element of scene safety for all emergency responders. Traffic presents a major hazard that needs to be monitored during emergency operations. Recently I was talking with a fellow fire officer about an accident that he was involved with as the Incident Commander. The accident involved several roadway fatalities, and one thing he remembered thinking about that night was the fact that he was now being placed in the same dangerous roadway conditions that had just cost several people their lives. As the Incident Commander he knew it was his responsibility to maintain the safety of everyone on-scene while providing help.

We have all been in similar danger-

ous situations like this, and we have to consider what to do to mitigate the conditions. We need to be alert while doing everything within our power to take those extra precautions in order to protect our personnel. Careful apparatus placement can provide a significant barrier to keep other vehicles away from the action area during vehicle extrication operations. Angling the apparatus will help to slow or divert traffic. Reducing or blocking the flow of traffic may seem unnecessary to some but the injury of one emergency responder seems unnecessary to me. We need to use the apparatus as a barrier to protect everyone on the scene from secondary accidents.

Several other considerations impact apparatus placement. Emergency vehicles should be placed so that they divert traffic and provide a barrier; they can also provide scene lighting during poor visibility conditions. Apparatus should be placed close enough for personnel to quickly access their tool cache, but personnel must remain aware of traffic when they're retrieving their tools, as other drivers may see only the apparatus and not the personnel around the apparatus. It's also important to remember that other emergency vehicles may need to access the scene and must not be blocked, and special attention should be made to keep the apparatus exhaust away from the action work areas of emergency responders and patients.



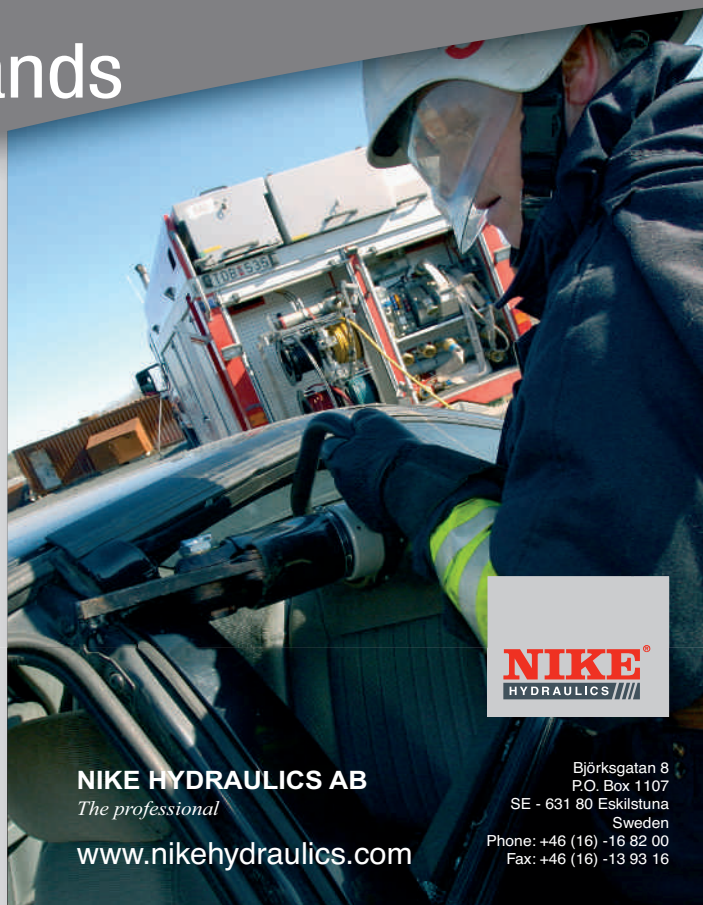
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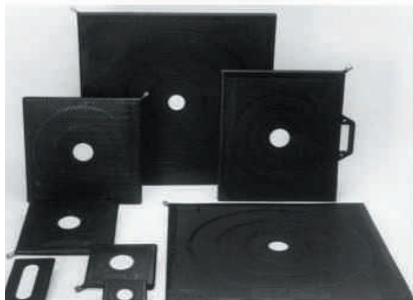
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## Basics = Success in Vehicle Extrication

### TOOL FAMILIARIZATION

Familiarization with extrication tools is critical to the success of extrication operations. Training with our tools will allow us to become more familiar with their uses and capabilities. One way I have seen that improves skills is by practicing on older cars. Going to a local salvage yard and practicing vehicle extrication twice a year can greatly improve our own skills and knowledge about vehicle extrication. Since many salvage yards crush their vehicles several times a year, a simple phone call to the manager might get you permission to use them for practice. While practicing on undamaged vehicles appears to be good training, it is not the same as on-scene conditions involving vehicles at high speed collisions. High-speed collisions add a certain dynamic to vehicle structural damage that sometimes makes it harder to place tools properly. There is no real way to get training like

this, but with basic training on vehicle design and tool familiarization you can acquire the knowledge to be fairly proficient with these types of extrications.

How do we deal with major vehicle damage? The extent of damage to the vehicle and patient location will determine your action plan. During training, focus on opening a vehicle door, rolling the dash, and removing the roof. Gaining access to an occupant by removing or just popping a door is very common. When practicing these skills simulate a power failure and utilize other power tools and hand tools. We never know when our equipment will fail so we must have a basic understanding of how to use other tools for vehicle extrication. Since there are many methods and techniques for opening doors, the specific procedure at any given accident will depend on the tools you have available.

Tool safety needs to be covered every time the tools are used during training.

When operating tools, be very alert to their placement and to the forces being generated. All vehicles need to be stabilized initially upon arrival and before using extrication tools. Stabilization of the vehicle will help in reducing tool action by maximizing its effectiveness. These forces are very powerful and it is the tool operators' responsibility to control them. Allow the tool to do the work and don't force the tool in an unsafe manner. The tool operator needs to go as slow as possible while watching the action and reaction of the tool to avoid placing the tool in a bind while remaining outside the pinch zone. If any undesired action or unsafe situation occurs during the operation of the tools, stop and reevaluate the situation before continuing. The main goal of extrication is to remove the vehicle from around the patient and provide a pathway to remove the patient from the vehicle without causing more injury to them as well as first responders in a timely manner.

With the abundance of information available on vehicle extrication, where do we start to provide the best training? The best way to begin is with the basic, fundamental skills of vehicle extrication. This should include training on vehicle design, scene size-up, scene safety, apparatus placement, and tool familiarization. Seek this information and training through people within your own organization or local vehicle extrication classes. There is also an abundance of written information available in books, articles, and information found on the Internet.



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 E-Mail: Paul.Ratcliffe@lancashirefire.org.uk

Other countries:  
**ICET B.V., P.O. Box 430, 4940 AK RAAMSDONKSVEER, The Netherlands**  
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In addition to class work, there also needs to be physical, hands-on training with the tools to provide a sound working knowledge of the extrication tools. Frequent training with our own tools instills a comfort and confidence in our equipment. Continue learning, continue physical training and continue watching for new techniques and equipment. As our department begins to master the basics in vehicle extrication, we now have a solid foundation to build upon and we can then move forward towards becoming more advanced in vehicle extrication.

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## RESCUE HYDRAULICS FROM NIKE HYDRAULICS AB

Nike's business concept is "to be a specialist in high-pressure hydraulics, and within this field to develop, manufacture and market equipment that helps the customers to generate/produce power where weight and space are limiting factors".

NIKE provides a complete range of hydraulic rescue tools consisting of manual tools, motor operated tools, pumps, hose reels and a wide range of various kits and accessories.

The rescue equipment has been developed in close collaboration with rescue organisations in various markets served by NIKE.

Quality and safety are always in focus with our products, we are certified by both the quality standard ISO 9001 and the environmental standard ISO 14001. Our rescue products are CE-marked and will fulfil the requirements in the European Standard EN 13204, where applicable.

NIKE rescue products are used world-wide by various categories of Rescue Services, Civil Defence Services, Military and Police organisations, etc.

The product range includes self-contained manual tools ready for use within seconds (cutters, spreaders, kombi tools etc.), powerful motor operated tools (cutters, spreaders, kombi tools and cylinders), pumps (manual hand-/foot-operated pumps, motor driven pumps with electrical motor or petrol engine.

Hose reels, various rescue kits (manual or motor driven) and a wide range of accessories.

### Motor operated tools

Heavy duty tools, such as cutters, kombi tools, spreaders and cylinders. The NIKE line of heavy duty tools has been proven it selves within rescue organisations thorough out the world. Today's car technology has rapidly increased the demands of the rescue tools. On of the toughest cars to extricate today is the Volvo SUV XC90, which we successfully extricated with our cutter DHS150 using only 70% of the maximum available force.

The NIKE line of heavy-duty tools, such as cutters, kombi tools, spreaders and cylinders, has been proven it selves within rescue organisations thorough out the world. Today's car technology has rapidly increased the demands of high performing rescue tools. One of the toughest vehicles when carrying out extrication operations is the Volvo SUV XC90, which is a well known fact among the manufacturer of Hydraulic Rescue Tools. The cutter DHS150 successfully cut off the heavy duty designed posts on that vehicle, using only up to 75% of the maximum available force.

NIKE has pleasure to introduce (at the Interschutz exhibition) a new line of "Light weight Motor Driven Tools". This line of tools combines power with light

weight and small overall dimensions witch makes it useful when performing rescue work in confined spaces.

NIKE will exhibit their products at INTERSHUTZ 2005 and has the pleasure to introduce a new line of high performing "Lightweight Motor Driven Tools". This line of tools combines power with lightweight and small overall dimensions, which makes it useful when performing regular rescue works as well as operations in confined spaces.

### Manual tools

Self-contained tools ready for use within seconds, the tool series includes cutters, kombi tools, and spreaders. The tools are easy to carry and are especially useful in situations when there is a problem with supply of power for motor operated tools, the tools are also often used as back-up or supplement tools for the motorized tools.

NIKE presents (at the Interschutz) a new (lighter) series of cutting tools which also uses a new pump technology which improves the effect of every pump stroke.

NIKE also introduce, at the INTERSHUTZ 2005, a new (lighter) series of cutting tools which also uses a new pump technology which improves and increase the effect of each pump stroke.

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Nike provides a full line of pumps designed to provide sufficient power in any situation. The product line includes electrical-, petrol – and manual pumps. The pumps can be configured for connection of up to for tools at the same time.

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NIKE also launches a new line of extreme lightweight Power Packs for connection of up to two (2) tools.

### Accessories

NIKE provides a full line of accessories to improve the applicability of all tools (blades, attachments, tips etc.). The accessories also includes supplementary equipment as glasscutters, support blocks etc.

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# Industrial

industry falls to Emergency Response Teams (ERTs), collections of highly trained and dedicated individuals with ever-increasing demands on their response capabilities. Effective training props for these ERT members must be able to replicate incidents of varying complexity in order to provide a full spectrum of training that puts responders through pre-planning, size-up, and mitigation drills. The more flexible training props are best able to help ERT members to exercise and develop their skills as they work through evolutions of varying complexity.

Training has proven its value time and again over the years, saving many firefighters' lives during actual emergencies. During a crisis situation, responders must act decisively and with precision; their fundamental skills should not occupy their thoughts at all, freeing them to assess the situation according to its individual complications. The more they have trained the more they can rely on the skills developed through exercise to lead them safely through the incident. Training takes on increased importance as facilities are built with greater complexity and the resulting fires evolve with more complications, while plant personnel suffer reductions – the old days of having 8-10 people on a hose line have been replaced by current staffing levels, which often limit an entire initial response team to 10 or fewer individuals. Contemporary ERTs rely more and more on mutual aid from other departments and nearby facilities; training becomes all the more important when the need for seamless team integration is considered. As budgets are tightened and teams are reduced, training is often seen as an easy budgetary target, but the need for quality training using quality props has never been more pronounced.

The Incident Command System is singularly useful for multi-agency response situations. Using ICS guide-

**WHAT MAKES A GOOD PROP FOR INDUSTRIAL FIRE TRAINING?** The answer is considerably more complicated now than it was a hundred years ago, when trainers would dig a pit, fill it with anything flammable, and ignite it, while the firefighters being trained would fight the fire often wearing nothing more protective than their everyday clothes.

There were no standards or laws that addressed firefighting practices, safety, or even the impact of firefighting training on the environment. Today, NFPA, OSHA, and the EPA are only a few of the many associations that help to protect the firefighter and the environment; the NFPA and OSHA now have standards that govern almost every aspect of the emergency responder's job – including training – and the EPA mandates

environmental protections that impact the ways live burn props are built, the types of fuels and extinguishing agents that can be used, and the capture and treatment of run-off.

Training props for industrial firefighters are also influenced, naturally, by the evolution of chemical/petrochemical businesses into a multi-billion dollar industry with complex facilities and processes that pose a variety of potential dangers. Protecting this



Pic: Courtesy of E.S.T.I.

# burn props

lines helps to ensure accountability, safety, scene control, and agency integration; in short, the potential for chaos and confusion at a fire scene increases when outside teams are called to assist, and ICS helps to minimize that chaos and confusion. Yet implementing ICS on-scene requires advance knowledge and practice, and industrial training grounds are the perfect places for studying, practicing, and perfecting ICS implementation. This is only one example, but a critical example nonetheless, of the increasing need for training as budgets constrict.

Reductions in force can have a critical impact on the quality and safety of training exercises themselves. As recently as 2004, emergency responders are sustaining injuries and even death during exercises. Training must be provided by qualified instructors using the best training facilities in the world. When either of these requirements is not met, it is our emergency responders who ultimately suffer. Safety among emergency responders tops the list of priorities held by incident commanders and front-line responders alike; when an emergency responder dies during training or an actual incident, all ask if everything possible was done to prevent the tragedy. A key contributor to safe incident operations is the training each responder has had; a key contributor to safe training is the facility and equipment itself. One of the most important elements is the fuel used for training. The old pits, filled with anything that would burn, were extraordinarily dangerous to firefighters and the environment alike. Large clouds of black, brown, and blue smoke carried toxins into the atmosphere, and at times the fires could not be extinguished and were left to slowly burn themselves out. New standards and

*Pic: Courtesy of E.S.T.I.*



regulations now dictate that the cleanest and safest fuels be used in training, to protect both the firefighters and the environment from unnecessary and preventable harm. Most industrial props now rely on clean-burning propane and some type of environmentally friendly liquid with predictable behaviors to fuel these training scenarios. Extinguishing materials must be environmentally friendly as well, capable of mitigating the impact of fuel and waste run-off from the prop.

As for the props themselves, a simple key to the design of a good prop is to make it as realistic as possible. The industrial fire prop should represent actual units in the chemical

## Real Fuels. Real-life Situations.

Offering one of the finest emergency response programs and training facilities in the world, the University of Nevada, Reno Fire Science Academy presents specialized instructional programs in:

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*Pic: Courtesy of E.S.T.I.*





Pic: Courtesy of E.S.T.I.

processes, or get as close to replication as is feasible, and the failures should represent actual failures, such as high pressure leaks in pumps and compressors, flange and seal leaks, and leaks in overhead pipe units. The complexity of these failures, all available for scenarios using a single prop, contribute to the realism of replicating crowded industrial facilities, where walkways are small and cluttered, pumps, compressors, and overhead pipe racks are everywhere, and the convoluted layout makes pulling a hose a nightmarish task. Props must contain all of these hazards and obstacles to simulate conditions as realistically as possible, while staying safe for the personnel using the props for training.

The complexity of the prop and its multiple failure points contributes to the practicality of multi-functional training. Diverse clients require diverse training scenarios, and effective training props must be able to accommodate a variety of training needs. With a quick flip of the switch, opening or closing a

valve completely changes the prop and the evolutions possible, and scenarios can be constructed that best replicate the situations any given client may encounter at their home facility. There is no reason, for example, for a client to burn LPG during training when all they deal with at their home plant is liquids. As new fuels are developed, props must accommodate them as well as the new techniques that are developed to fight the new kinds of fires. New firefighting equipment is designed and put into use constantly – thermal imaging cameras and firefighting foam are everyday tools used by today's firefighters, and today's industrial props must be capable of supporting scenarios that enable firefighters to train using the latest tools.

Multi-functional props also support pre-planning – a life-saving procedure that has proved over time to be invaluable to the efficiency and safety of incident response operations – and size-up. Industrial fire props give firefighters the opportunity to study a structure with

deliberation and care, teaching them how to review a facility and anticipate hazards and failure points. Developing pre-planning proficiency using industrial props on a fire training ground helps firefighters how to establish special strategies and tactics needed to combat large industrial fires. Preplanning during training leads directly to incident size-up. Fires are ever-changing: gravity and wind are just two of the conditions an emergency responder must factor into his plans for attacking a fire, and again the industrial fire prop proves invaluable as a tool for teaching responders how to assess all of the conditions at a fire scene that will impact the response planning and operations.

Liability issues are another aspect of training that affects industrial prop design. Training institutes have been held civilly and criminally liable for injuries sustained by students. Props must be constructed and engineered according to the highest standards, and the prop must be maintained and serviced to ensure its structural and operational integrity. NFPA and OSHA both offer standards that alleviate the possibility for injury at a training facility. NFPA 600 defines fire brigade training centers, NFPA 1981 defines minimum standards for interior and exterior fire brigades, and NFPA 1043, the newest standard, regulates procedures for interior attacks. These standards, together with a high level of instruction and training using cutting edge props designed to protect the trainee and the trainer, ensure that our emergency responders will continue to receive the best training possible.



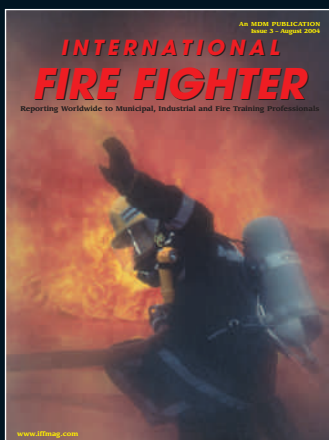
Pic: Courtesy of E.S.T.I.

The firefighter's main job is to go home safely to their families at the end of each shift. The responsibility of the training institute is to provide the highest quality training using the highest quality facilities to make sure that firefighters are best equipped to protect our life and property most efficiently and at minimal risk to themselves. Training is just one of many tools that the responder relies on during an incident, but it is the only tool that each member of the team can rely on with complete confidence in a crisis.

# INTERNATIONAL FIRE FIGHTER

## ***AUGUST ISSUE 2005***

### **Attention all manufacturers!!**

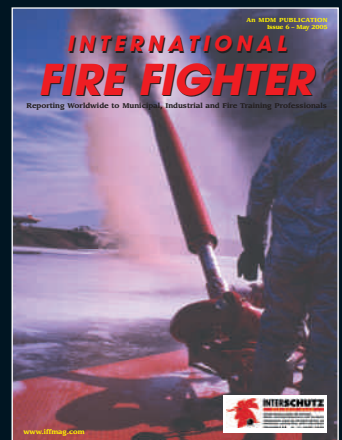
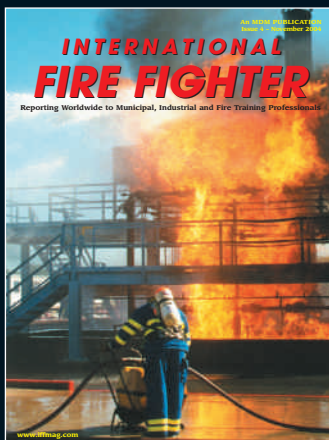
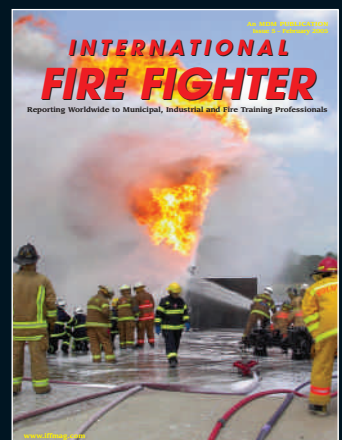


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## THE INGSTRÖM ESCAPE CHUTE PRODUCT UPDATE



Mr. Stig B Ingström developed the concept of "The Ingström Escape Chute®" that allow people from tall structure to slide down to the ground. The product and trade name patented and first marketed by AB Ingström & Co OY (the inventor's company) in 1982. Mr. Stig B Ingström, a Finnish-Swede, who has been a specialist in the textile industry for over forty years and in 1982 he focused on the production and marketing of the

Ingström Escape Chute® system worldwide. Mr. Stig B Ingström is determined to make AB Mobiltex OY not just the world's largest escape chute producer, but the safest.

Ingström Escape Chute® is manufactured in Finland and all materials used for the construction of the chute are of EU origin. While the marketers of the 'look alike escape chute system' in the Internet may claimed that the operations of their chute is the same as Ingström Escape Chute®, the technical specification of the chute construction is totally different from the escape chute manufactured by AB Mobiltex OY.

Ingström Escape Chute® is manufactured in conformance to its performance as "escape chute" tested by The Josef Tuliszkowski Scientific and Research Centre for Fire Protection, Warsaw, Poland, that permit evacuation from high-rise structures during an emergency. All the installations of the Ingström Escape Chute® worldwide have Guarantee/Trade Warranty of 18 months and with Product Liability Insurance. AB Mobiltex OY provides testing and commissioning, training, after-sales-service and maintenance through its authorized and trained distributors worldwide.

Today, AB Mobiltex OY is the leading manufacturer and major supplier of escape chute evacuation system throughout the world, with HQ sales office based in Sweden, and factory in Finland. In 1998, it established office in Singapore and in Australia to expand its operations and to develop close working relationships with its customers, distributors in the Asia Pacific region. The company in Singapore is known as Escape Consult Mobiltex (S) Pte Ltd (199800266D) and the company in Australia is known as Mobiltex Far East Pty Ltd (ABN 44 075 965 089).

Without breaking any confidence, AB Mobiltex OY and the regional dealers wish to announce that they have no business relationship or professional involvement with those 'look alike escape chute system' of Ingström Escape Chute®, products or companies marketed through web-sites in the Internet. They does not represent "Ingström Escape Chute®", which has a proven record of over 22 years for the safest and most efficient evacuation systems or AB Mobiltex OY and the regional dealers in any capacity. They are not the contractor or supplier of Ingström Escape Chute® and AB Mobiltex OY and the regional dealers does not supply or guarantee any 'escape chute' type system that are currently promoting and marketing by them in the Internet.

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## AKRON BRASS COMPANY

### NEW ZERO TORQUE (ZT) NOZZLE GRIP



Akron Brass has introduced its new, innovative ZT nozzle grip which was specifically designed with fire fighters in mind. The ZT nozzle grip has unheralded ergonomics for exceptional handling and control,

greatly reduced fire fighter fatigue and improved fire suppression effectiveness.

The ZT nozzle grip more naturally keeps the nozzle out in front of the fire fighter to allow for easier operation and provide better control, just like firefighters were trained to do. In addition, the pistol grip and inlet swivel are positioned to eliminate the reaction force torque found in all conventional pistol grip designs.

Conventional pistol grip nozzles are held at a position 3 1/2" to 4" below the center line of discharge, creating a torque. Traditionally, all the energy must be resisted at the firefighter's expense. The ZT nozzle grip is positioned to eliminate this torque and therefore fire fighters only have the straight reaction force to manage. This translates to less short-term fatigue and better overall firefighting. The ZT nozzle grip is available on any 1 1/2", Mid-Range, Wide-Range, and 2 1/2" Turbojet, SaberJet, or Assault nozzle.

For more information about the new ZT nozzle grip or other Akron Brass products, call your local authorized Akron Brass distributor or the Akron Brass Customer Service Department at 1-800-228-1161. Information can also be found in the "New Products" section of the Akron Brass web site ([www.akronbrass.com](http://www.akronbrass.com)).

Founded in 1918, Akron Brass is a worldwide marketer and manufacturer of high performance fire fighting and rescue equipment. A Premier Farnell company, Akron Brass is ISO 9001: 2000 registered and has an excellent reputation for developing and manufacturing innovative products.

**For more information, please contact:  
Richard Duda  
Tel: (330) 287-7158**

## PR 47 NEW DECONTAMINATION SYSTEM LAUNCHED BY HUGHES

Stand D58 Interschutz - Hanover - June 6-11 2005



Hughes Decon Systems is showing a new light-weight walk-through decontamination shower.

The first units have already been delivered to the military and civil defence authorities in Belgium. The Cupola Lightweight Mk1 is a compact, multi-purpose unit designed for rapid response in the event of CBRN incidents and

industrial chemical spillages.

The unit is easily carried in its high visibility valise which opens out to form a protective ground sheet. This is permanently attached to the base of the unit and provides protection against sharp objects when the system is being positioned or when it is in use. Joints on the inflatable frame are glued and taped, rather than welded, as this has proved to be a more reliable method.

An air cylinder which comes with the kit, provides a low pressure supply to inflates the four legs and create a frame to support the removable liner. An additional air inlet is also available so that the shelter can be inflated using an independent cylinder. A pressure relief valve prevents over inflation of the frame.



Showering takes place within the removable translucent liner which is hung from the inflated frame using Velcro sleeves. Entrance and exit flaps in the liner can be sealed to contain the over spray during showering. The wash-off is collected in a sump in the base and can be

pumped out through a waste connection in the liner.

Support personnel can monitor the decontamination process through windows on both sides of the unit and offer assistance by using the integral gloves fitted in the liner wall.

Seven nozzles at head and chest height ensure rapid and thorough showering. These can be supplemented using a hand-held wash brush fitted to a coiled hose. To ensure stability in adverse conditions, the unit can be secured to the ground using guy lines and pegs. The design is based on Hughes' extensive experience in developing inflatable decontamination shelters and is intended to withstand repeated use in the most demanding conditions. Despite this, punctures can occur and to ensure the unit is returned to service as quickly as possible, a repair kit is included.

"Authorities now have even greater choice in sourcing the most cost-effective solution," says Hughes Decon Sales Manager, Andy Whitehead. "A Mk2 version can accommodate two stage decontamination."

**For more information contact:**

**Hughes Safety Showers**

**Tel: 0161 430 6618**

**Fax: 0161 430 7928**

**Web: [www.hughes-safety-showers.co.uk](http://www.hughes-safety-showers.co.uk)**

Melba Industries, Australia's premier manufacturer of high performance fabrics to the industrial, fire, safety and military markets, would like to introduce MELBAMAX – a revolutionary new fabric concept. For many years the idea of a tough, inherently flame-retardant fabric conjured up thoughts of an uncomfortable, hot and expensive system. This is no longer the case. Melba Industries has taken the strength elements of a super fine Nomex Comfort fibre and blended in the most breathable fibre in the world – fine merino wool. The union of these two outstanding fibres has resulted in the most breathable, comfortable and durable inherently flame retardant product available anywhere in the world.

Australia's climate is very challenging. Our fire-fighters are confronted by extreme heat and humidity. Heat stress is a major concern. Melba Industries is a licensee of Woolmark. In conjunction with Woolmark and Australia's leading research institute – the CSIRO, we have designed a blend that will solve many of your problems. MELBAMAX utilises the uniqueness of wool. Many other fibres such as cotton and poly/cottons will absorb perspiration – they will become wet with sweat before they transfer moisture away from the wearer's body. The wearer is uncomfortable – the garment sticks to the body – in cool climates the wearer could become chilled. In these situations wool is the answer. Body vapour is drawn through the core of the wool fibre. The outer sheath remains dry. Therefore the wearer will remain dry. Before the body vapour turns to sweat it is removed through the wool fibre and through the protective garment layers.

The uniqueness of wool is combined with Dupont's outstanding Nomex Comfort fibre. Tough, durable, with high lightfastness properties Melba has taken the best manmade fibre and blended it with the best nature can offer. We provide this new concept in one weight and it is ideal for use as a polo shirt or under-garment where worker comfort and protection is of paramount importance.

The value of a super breathable protective fabric cannot be understated. There are many fabrics that offer protection but few offer the wearer true comfort. MELBAMAX has taken comfort and performance to a new level.

**For more information contact:**

**Rob Walsh at**

**[Robert.Walsh@melbaind.com.au](mailto:Robert.Walsh@melbaind.com.au)**

## INTERNATIONAL FIRE SERVICE CO-OPERATION AS ZAGREB VISITS WILTSHIRE FIRE BRIGADE



In a move aimed at developing a higher level of co-operation between fire services in the UK and those from developing countries in the former Eastern Bloc and to help introduce improved levels of safety and performance, senior fire officers from Zagreb, Croatia, recently visited Wiltshire Fire Brigade.

Bristol Uniforms arranged the one day visit to allow the Zagreb fire service to see at first hand the developments which have resulted from the close working relationship developed over recent years between themselves and Wiltshire Fire Brigade. During this time Wiltshire, as a member of the South West Consortium, has not only confirmed its long term commitment to the use of Bristol's fire coats and trousers but has also adopted the Bristol Care PE managed care service which provides a fully integrated computer tracked wash and repair programme over the lifetime of all articles of PPE.

Chief Fire Officer Malcic and his colleagues from Zagreb Fire Brigade, whose firefighters also benefit from wearing Bristol PPE, spent the day visiting a number of Wiltshire Fire Brigade locations including Westlea, Swindon and Devizes. The programme included firefighting demonstrations, an RTA extrication demonstration and discussions on the handling of incidents involving hazardous materials which is an area of particular interest to Zagreb.

Wiltshire's Chief Fire Officer, Andy Goves, commented, "I am extremely pleased that Bristol Uniforms asked Wiltshire Fire Brigade to host this visit of a fellow Chief Fire Officer and his senior colleagues". "Such opportunities are rare and present an opportunity for Wiltshire's firefighters to demonstrate their professionalism and high levels of public service". "This is very much a two-way process and I am sure that our visitors gained as much as we did from this useful exchange of information and expertise".

Roger Startin, Bristol Uniforms' joint MD, commented, "We were delighted that our friends at Zagreb were able to make this visit which we see as being both operationally and commercially valuable in developing a more cohesive international business based on shared values".

**For more information about Bristol Uniforms**

**or Bristol Care please contact either:**

**Roger Startin, Bristol Uniforms Ltd on 0117 956 3101**

**or email [roger.startin@bristoluniforms.co.uk](mailto:roger.startin@bristoluniforms.co.uk)**

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# Product Update • Product Update • Product Update

## DECON SHOWER CLASSIC UNDERGOES REDESIGN



Acknowledged as the mother of all portable inflatable decontamination showers Professional Protection Systems' DPI (decontamination portable inflatable) unit has undergone its first extensive redesign since its introduction in 1996 revolutionised the decontamination shower scene.

Since then derivatives of this PPS unit have become, amongst other things, the standard decon shower for the NHS, Hospital Trusts and ambulance services in the UK as well as the decontamination mainstay

of emergency services throughout every continent. Highly effective, relatively low cost to purchase and operate, easy to transport and quick and easy to deploy, these are all factors that made the original DPI a classic.

They still apply to the redesigned DPI, but it is slightly larger. The inflatable supporting pillars and cross sections are also more robust giving the whole unit additional rigidity. The new DPI also incorporates raised flooring. Made from recycled plastics this keeps contaminant away from legs and feet. The new unit has also been designed to take practically all of the vast range of accessories that PPS offered to accompany the original model without any conversions being necessary. The idea is that customers switching from old style DPI to new style don't incur unnecessary extra costs.

According to PPS Managing Director Mark Whitcher the scope, quality and size of the accompanying accessory range is almost as important as the basic unit. "It's the accessory range", he says, "that enable us to customise every unit and the fact that we can produce something to the customer's precise specification is one of the main reasons for the continued success of the DPI concept, especially in overseas markets". Just how far this process has come since 1996 can be judged from the fact that whilst the original DPI had no accessories the most basic unit now can easily have 17 or 18. This is the result says Whitcher not of commercial pressure but of emergency planning procedures being constantly rehearsed, reviewed and updated on both a micro and macro level.

**For further information, please contact:**  
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## HALE PRODUCTS EUROPE AT INTERSCHUTZ



Hale Products Europe will be showcasing a number of innovative fire and rescue solutions at Interschutz 2005 in Hannover this June through the leading brand names of Hale and Godiva. Exciting new products will be on display in the vehicle mounted and portable pump categories as well as the latest developments in Foam Proportioning and Compressed Air Foam equipment.

## Foam and CAFS

FoamLogix is the latest electronic foam proportioning system – this computer controlled system provides automatic prime, a foam agent induction range of 0.1 – 9.9% and a display of foam and water usage data all in a compact and cost-effective package. FoamLogix is the foam proportioning device for the Godiva World Series Pump with Integrated CAFS and also the MCP50 CAFS package. World Series CAFS systems are in service with a number of UK brigades, and Hale CAFS systems in general are very popular in Germany and throughout Europe.

## Vehicle Mounted Pumps

- World Series pump – various models showing the latest modular additions to this popular pump.
- World Series pump with Flow Independent RTP system – provides a guaranteed percentage of 3% or 6% Class B foam independent of the water flow rate. This pump will also be fitted with an integrated instrument panel.
- The top of the range World Series WT6010 pump with gearbox, and two single pressure pumps – WS2010 and the powerful GV10000 will be available to view.
- Class1 Instrumentation – on display will be a World Series pump with Class1 pump data and control instruments – Intellitank gauges and SPS panels.

Also on display the World Series pump De-contamination adaptor – designed to provide warm water for de-contamination shower units.

## Portable and Transportable models

- Latest version of the Powerflow 8/5 portable pump with the cooler, cleaner Briggs and Stratton engine and DIN exhaust connector. Both hand primer and exhaust gas primer models will be on display.
- The GP2300/15 is the latest version of the mid-range GP2300, diesel engine transportable pump. Powered by the Ford ZSG414 engine, this unit delivers 2400L/min at 7 bar from a 3m suction lift.
- Products from the American branch of the company will include the Qpak midship mounted vehicle pump, AP50 rear mounted pump and the latest version of the HP portable pump with a new Honda engine. The SMR-U is the stainless steel version of the Godiva World Series pump aimed at the North American market. Stainless steel provides a prolonged working life and guarantee against corrosion when using with seawater or contaminated water sources.

Also on display a selection of Typhoon positive pressure ventilation fans for effective control of smoke and fumes.

Sales and Technical staff from the UK and USA will be on hand to discuss any issues or questions visitors may have. The Hale stand is linked with its sister companies in the IDEX Corporation – Lukas and Vetter, specialists in rescue equipment supply. An ideal opportunity to review a large proportion of your fire fighting needs. We look forward to meeting you on our stand (Hall 12, Stand C30).

**For more information, please contact:**  
**Hale Products Europe**  
 Email: [admin\\_haleuk@idexcorp.com](mailto:admin_haleuk@idexcorp.com)  
 Website: [www.haleeurope.com](http://www.haleeurope.com)

## XENON PRODUCT RANGE RETIREMENT

### Service & Support Cease in July 2006

Vision Systems' commitment to provide Xenon product range End of Life (EOL) service and repair support will cease on 1 July 2006. This means that product replacements, repairs, refurbishment, support and spare parts will not be available after that date.

The intent to stop manufacturing of the Xenon range of smoke detectors was first announced in 1997. In June 1999, the sale of Xenon range of detectors including Xenon E700 (MKIII), E70D, Scanner and MiniVESDA, was officially discontinued.

Vision Systems would like to highlight to all customers and end-users with Xenon site installations, to strongly consider plans to phase out and replace these products with the new VESDA Laser-series range.

The Laser-series range of detectors which have been widely specified and installed worldwide today, provide an array of benefits:

- Product approval certification across all continents
- Absolute calibration laser chamber for maximum reliability and repeatability
- One detector for all applications, 0.005 to 20% Obs/m
- Lower cost of ownership as regular calibration is not required
- Dual stage filtration provides clean air bleed to maintain optical integrity of the chamber
- Flexible product range to ensure cost effective replacement of old technology
- And the local support to provide the assistance you may require.

**For further information, please contact:**  
**Vision Systems – VESDA office and distributor**  
**Website: [www.vesda.com/xenon](http://www.vesda.com/xenon)**

## NEW DECONTAMINATION SYSTEM FROM HUGHES



Hughes Decon Systems has delivered the first of its new lightweight, walk-through decontamination showers to the military and civil defence authorities in Belgium. They are compact, multi-purpose units designed for rapid response in the event of CBRN incidents and industrial chemical spillages.

"The Cupola Lightweight Mk1 is the latest addition to our range of decontamination systems," says Hughes Decon Sales Manager, Andy Whitehead. "Authorities now have even greater choice in sourcing the most cost-effective solution."

The unit is easily carried in its high visibility valise, which opens out to form a protective ground sheet under the unit. The base of the unit is permanently attached to the groundsheet, which provides protection against sharp objects when the unit is being

positioned or when in use. Joints on the inflatable frame are glued and taped rather than welded as this has proved to be a more reliable method.

An air cylinder, which comes with the kit, provides a low pressure supply to inflates the four legs and create a frame to support the removable liner. An additional air inlet is also available so that the shelter can be inflated using an independent cylinder. A pressure relief valve prevents over inflation of the frame.

Showering takes place within the removable translucent liner, which is hung from the inflated frame using Velcro sleeves. Entrance and exit flaps in the liner can be sealed to contain the over spray during showering. The wash-off is collected in a sump in the base and can be pumped out through a waste connection in the liner.

Support personnel can monitor the decontamination process through windows on both sides of the unit and offer assistance by using the integral gloves fitted in the liner wall.

Seven nozzles at head and chest height ensure rapid and thorough showering. These can be supplemented using a hand-held wash brush fitted to a coiled hose. To ensure stability in adverse conditions, the unit can be secured to the ground using guy lines and pegs. The design is based on Hughes extensive experience in developing inflatable decontamination shelters and is intended to withstand repeated use in the most demanding conditions. Despite this, punctures can occur and to ensure the unit is returned to service as quickly as possible, a repair kit is included.

A Mk2 version of the unit is also available with two separate lanes to double the throughput.

**For further information, please contact:**  
**Hughes Safety Showers**  
**Tel: +44 161 430 6618**  
**Website: [www.hughes-safety-showers.co.uk](http://www.hughes-safety-showers.co.uk)**

## CAPTURING REMOTE VIDEO FOOTAGE IN A FIRE SCENE? – NO PROBLEM!

Another exciting addition to the Argus®3 product range, the Remote Receiver Station is designed to allow the remote viewing of a thermal image from an Argus® camera, when fitted with the remote wireless telemetry option.

Gone are the days of portable monitors and trailing cables, the Argus®3 Remote Receiver Station is a compact carrying case comprising of a two-channel receiver with a built in 7-inch LCD colour screen and integral antenna.

The Remote Receiver Station requires a 12V dc power input, either via a standard cam-corder battery (used already to power the Argus®3 thermal imaging camera), a mains power supply or an on-truck charging connector (as used on and currently supplied with the Argus®3 storage mount).

Additional functionality comes with the ability to record live video footage from an incident. Using a standard connection lead, the Remote Receiver Station can be connected to a remote video recorder (not supplied), to capture thermal footage directly from the fire scene.



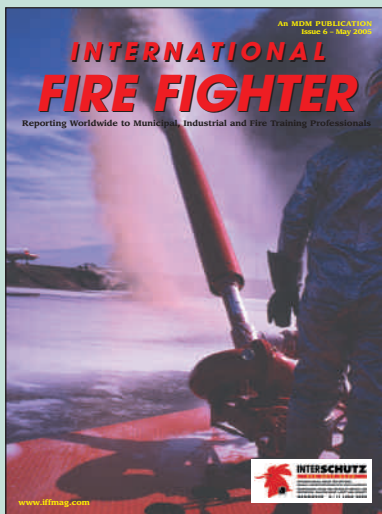
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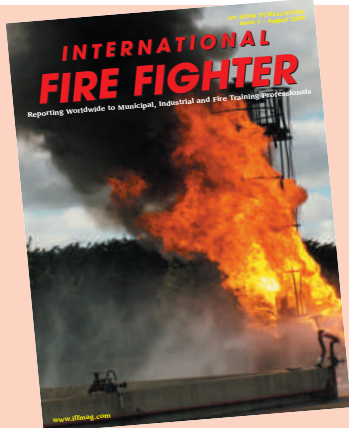
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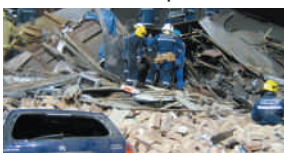
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## COMMENT

Welcome to issue 7 of International Fire Fighter. Things have been hectic over the last month or so with attending Interschutz in Hannover. My oh my, what a show but it did prove to be very successful and also another great reason to meet up with friends old and new. I hope that all of our readers are still enjoying the quality articles written by our contributing authors, I think most of you will find the article on page 47 written by Joseph A Wright & Grady North very interesting and informative, in light of the Airbus A380 coming into commercial service late next year. As mentioned in my previous comments, please feel free to contact me with ideas for future articles or content that you would like to see, I am always open to suggestions.

This now leaves me to sign off for another issue, the next one being in November and the last for 2005. Also by then, I will be married, so any offers of condolences will be most welcome.

Until then,

**Mark Bathard**  
Sales and Editorial Manager



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# Breathing air compressors and filling stations

By David Jackson  
Sales & Marketing Manager  
L&W Compressors



62 dB(A) Silent BA Compressor

WITH THE BROADER APPLICATION and use of SCBA equipment, the availability of a breathing air filling station warrants close examination. A few general rules apply and will help when considering the planning, installation and subsequent service and upkeep.

A filling station consists of at least 3 basic components:

- One or more high pressure compressor,
- breathing air purification
- a filling panel and
- (optional) a storage module

Whether these are combined into a compact unit or a modular system, the principles are the same.

## HIGH PRESSURE COMPRESSORS

The majority of high pressure air compressors are air cooled, oil lubricated (with a special compressor oil), multi stage, piston compressors. The air is sucked in and then compressed in 3 or more stages up to 200-420 bar, depending on the application.

One of the primary factors for a compressor is the drive. Most stationary applications will be driven by an electric motor, usually 3-phase. The electrical supply must be large and stable enough to cope with this consumption especially the surge during start up.

The quietest compressors (Noise level <65dB(A)1m), are electric driven and encapsulated in special housings, these are suitable for location in working areas or for installations in mixed residential/industrial areas.

If no (reliable) power supply is available, the compressors can be driven by combustion engines, either petrol engines or the more preferred and reliable diesel drive.

Because almost all of the energy

consumed in a high pressure compressor is converted into heat, one of the most important yet often overlooked subjects is the cooling air flow over the compressor. As a rule of thumb, 300m<sup>2</sup>/h cooling air flow is required for each kW of power drive and the internal ventilator(s) on the compressor will attempt to move this volume of air over the compressor. It is therefore important to ensure that the inlet air is as cool and plentiful as possible and the exhaust air is expelled away from the compressor.

Extractor and inlet fans are often a valuable investment, particularly for small compressor rooms. Air conditioning is impractical because of the power consumption and high costs.

If the cooling air flow is restricted or badly designed then the compressor will suffer from material breakdown over an extended period of time. The breathing air purification process is immediately effected (more later). The closer the air outlet temperature to the inlet temperature is, and the lower this is, the better. The minimum operating temperature is usually +5°C, the maximum should not exceed 50°C.

The other air that the compressor needs is the air that ultimately goes in the SCBA cylinders. This should start off as clean as possible and inlet lines should avoid external contamination such as central heating rooms, vehicle parks or streets.

Options are available for compressors, but the actual application will dictate the usefulness. As a minimum, an automatic

stop is highly recommended, this shuts the compressor down at the final pressure. If the compressor runs without direct supervision and attention for longer than 15 minutes, then an automatic drain is recommended to avoid manually draining the condensation. Oil pressure monitoring, oil temperature monitoring and other options are helpful if the compressor is located in a separate location to the filling panel.

As with all machinery, preventative maintenance schedules are designed to ensure long trouble free life, a maintenance contract ensures good service and fast help if required.

## BREATHING AIR PURIFICATION

The air that a high pressure compressor produces is contaminated and relatively moist. To reach breathing air standards such as the EN 12021, the air must be purified. Part of the purification process starts between the stages of the compressor where the air should be cooled after each stage to encourage the formation of condensation and then pass through a separator where the condensation is mechanically removed. Inter stage separators even after the first stage are especially important in humid climates or weather systems where a large amount of condensation is generated. Contrary to popular belief, this increased humidity only effects the amount of condensation between the stages and life of the final purification filter is unaffected by the air humidity.

After the mechanical condensation separation is completed the air needs to be dried to a dew point of approx -50°C (<25mg/m<sup>2</sup>) and the oil and odour is





200 & 300 bar Filling panels with BA Flanges

removed ( $<0.3\text{mg/m}^3$ ) with a special filter cartridge. CO and/or CO<sub>2</sub> contaminants may also be filtered out at this stage, filters with this facility are usually standard on compressors with combustion engine drive.

One factor already mentioned is temperature. Higher temperatures will have an adverse effect on generating condensation for mechanical removal. This means the higher the air temperature leaving the final stage separator, the more work the final filter has to work removing moisture and oil traces, thus shortening the life of the filter. For larger capacity filling stations and those located in warm climates, refrigeration dryers will come into their own and indeed pay for themselves in saved filter costs quite quickly. The air is cooled down to approx  $+3^\circ\text{C}$  provoking much more condensation formation and the air then passes through a mechanical separator, thus increasing the filter life.

As an example of the extreme effects of higher temperatures, if a filter lasts 33 hours at  $20^\circ\text{C}$ , it will only last 10 hours at  $35^\circ\text{C}$ .

To monitor the filter status during filling operations, the most economical and reliable method is to monitor the moisture content. The oil/odour capacity of a filter is usually 2-3 times longer than the moisture capacity on a correctly operating compressor. Redundant moisture controllers can be fitted either on new compressors or as a retrofit to provide filter monitoring on existing installations.

Air quality testing should be done periodically using approved testing kits.

### FILLING PANELS

Filling panels are the "front office" of a filling station where the operator interacts with the installation. They should be user friendly and safe. The connection between the SCBA cylinder and the high pressure breathing air is via a filling valve and either a direct flange connection or a high pressure hose and filling connection corresponding to the SCBA cylinder valve. Both types of connections have their advantages and disadvantages although the direct flange connection is more popular in Europe. The height of the connection is important in this case, as the operator has to hold the cylinder up and screw in the filling connection, hip height is ideal. Filling hoses provide more flexibility and allow the cylinders to remain in a trolley whilst being filled.

The filling valve should be easy to operate, reliable and as quiet as possible. Self venting lever operated valves are the most popular. The explosive noise of air venting out of filling panels can be reduced using silencers although hearing protection is recommended. If filling panels are located in working areas such as SCBA workshops then the venting line can be taken out of the building to ensure other work can be carried out such as leak checks in a BA workshop.

The ergonomics of the filling panels are almost as important as the mechanical features.

An associated subject with the panels is the working pressure. Most modern SCBA cylinders are 300 bar working pressure. For

300 bar working pressure, a 330 bar over pressure valve is installed in the system to ensure safety. If a user has more than one working pressure then the higher pressure needs to be safely reduced to the lower pressure and again made secured with an over pressure valve. The most common combination is 200 and 300 bar. Some older or smaller applications may use a simple cross over valve for selecting either 200 or 300 bar, however these do not allow simultaneous filling operations.

### STORAGE MODULES


Optional storage modules provide banks of air for fast filling operations. The storage modules can either be piped in a single system providing high capacity or piped in stages for cascading into the SCBA cylinders.

The storage modules consist of a bank of tanks and a storage management control. The storage controls are either manual or automatic, with the auto filling panels gaining in popularity with their simplicity and effectiveness in use.

The use of 420 bar as a storage pressure allowing cascading down to 300 bar is popular in North America although the advantages are questionable particularly considering the physical properties of air at such pressures (the volume/pressure relationship becomes less linear the higher the pressure goes) and the costs involved in such high pressure storage systems.

Small compressor, large storage tanks! Looking at storage investment and upkeep and at compressor investment and upkeep, it may seem logical to get as small a compressor as possible and a large storage module to compensate for the compressor capacity, but generally speaking, the smaller the compressor the less it is suitable for continuous running i.e. refilling storage cylinders, so this option should be avoided.

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# Personnel Accountability

By Craig A. Walker,  
Division Chief (Ret.)

Base receiver of 2-way signaling  
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## A Critical Component of Emergency Incident Management

THE FOLLOWING ARTICLE FOCUSES on Personnel Accountability as it relates to first responders everywhere, and points out some of the problems that are common in the fire/rescue, and other emergency services. In the world of today, planned responses to emergency incidents can no longer be single agency specific. Weather events, natural disasters, and the possibility of terrorist attacks require broad planning and eventual coordination and organized integration of several agencies and multiple jurisdictions at the site of a large-scale emergency incident.

During emergency incidents of any proportion, the safety of the general public and civilian population is, and always should be the paramount concern. First responder casualties that occur significantly compound the scope of the problem, especially, if there is no means of immediate notification that a Mayday situation exists. Command personnel must have a reliable means of receiving alarm or Mayday calls from emergency first responders. The means of providing these alerts cannot rely on voice radio frequencies, where only one person can talk at one time. Technology must be employed to effectively relay these messages independent of push-to-talk (PTT) systems. The ability to send the signal calling for general or selective evacuation, also operating below the PTT 'radar', is another crucial component of the first responder personnel safety and accountability solution.

### A BRIEF HISTORY OF PERSONNEL ACCOUNTABILITY

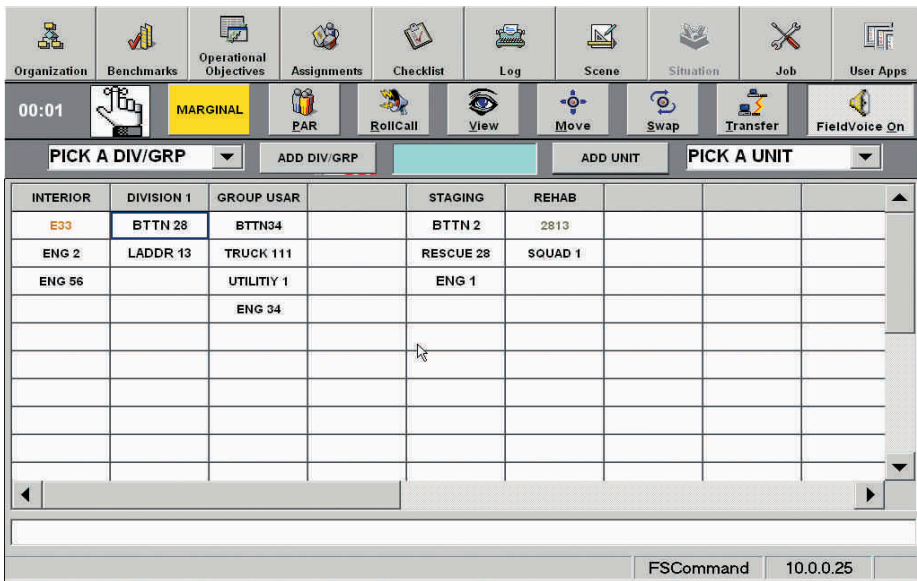
Fire chiefs and other emergency services leaders across the country have grappled with the Personnel Accountability issue for the last several years. The instances of firefighters becoming 'lost in structures' occurs all too frequently. Early approaches to solving this problem included ID tags, bar-

coded ID systems, and tag point-of-entry systems. Local notification of a distress situation depended on an individual's ability to call for help on an available PTT radio channel, or the activation of a Personal Alert Safety System (PASS) device that would be noticed by personnel in the immediate area.

Many of the limitations experienced by emergency services providers were due to a lack of available technology. Simply stated, fire and emergency services personnel were doing the best they could using old fashioned methods and equipment. In the post-modern era of emergency preparedness, first responders must be fully prepared to manage personnel resources from multiple agencies, departments or

*The instances of firefighters becoming 'lost in structures' occurs all too frequently. Early approaches to solving this problem included ID tags, bar-coded ID systems, and tag point-of-entry systems.*





SIX STEPS TO SUCCESS

Step 1 — Adopt and Implement Personnel Accountability Procedures

The first step in dealing with the Personnel Accountability problem is to implement a set of procedures that are functional and can be easily managed in your department. Whether we are talking about a metro department, a metro system, a federal or national department, or an industrial fire brigade (or any combination of the above), there are appropriate procedures that can be employed

Regardless of structure, the following factors must be included in deciding which Personnel Accountability procedure to implement. These factors include:

1. Is the department staffed by career employees, volunteer firefighters, or a combination of both?
2. What is the emergency response structure? In a metro department, with little or no mutual aid considerations, different steps must be taken to implement a procedure and outfit personnel with the equipment necessary to manage the system than in a department that relies heavily on mutual aid companies.
3. Are departmental staffing levels generally abundant, or are they lean? Accountability procedures must be designed to work with the numbers of personnel that are generally available on the scene.

The Personnel Accountability procedure should include the assignment of a standby Rapid Intervention Team (RIT).. The purpose of this crew is to facilitate an immediate search and rescue effort when necessary. On multiple alarm fires, or other geographically large operations, additional RIT crews should be located near each remote point of entry.

Step 2 – Incorporate Accountability Into the Incident Management Structure

In recent years, there has been a great deal of attention and focus given to establishing and implementing an

Display of NIMS compliant computerized Incident Management System (courtesy of FieldSoft, Inc.)

jurisdictions. Interoperability at all levels, especially for notification of first responders in distress and evacuation from dangerous locations has become a prime directive. Traditionally, the fire/rescue service approached these problems by assembling a solution that combined a variety of different technologies and products into a satisfactory system. Today's demands call for a new approach, one that affords a *total solution concept* to the problem.

The good news is that technology is finally catching up with the challenge at hand. Safety products are now available on the marketplace to address many of the problems faced by those who respond to or command emergency incidents. Several manufacturers are now using radio frequency technology to transmit and receive critical personnel accountability data. Using a variety of techniques and approaches to provide an answer, new products are being introduced at a record pace. Fire departments, law enforcement agencies, and federal response personnel should carefully evaluate and compare the benefits offered by each solution. These are some of the key questions to ask when evaluating these systems:

- Can the solution provide the identities of those personnel operating at the incident, independent of voice PTT radios?
- Does the solution provide immediate notification of one or more responders in distress?

- Does the solution provide the user identities of those in a Mayday situation?
- Can the solution, independent of voice PTT radios, initiate and order an evacuation?

- Does the solution have sufficient range and signal penetration to accommodate your needs?
- Does the solution have the capacity to process the number of personnel that may be operating at a large scale incident?
- Does the solution provide multi-agency or multi-departmental interoperability?



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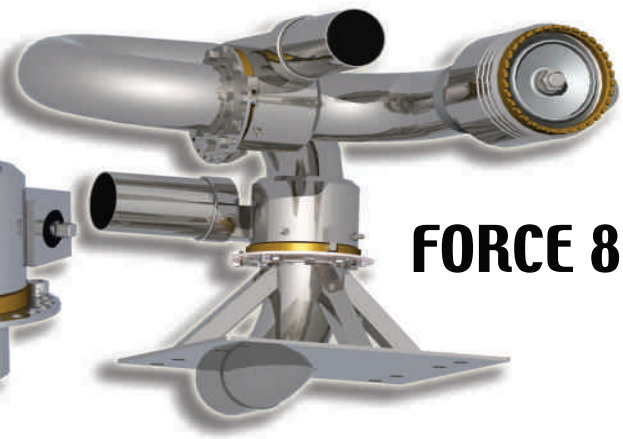
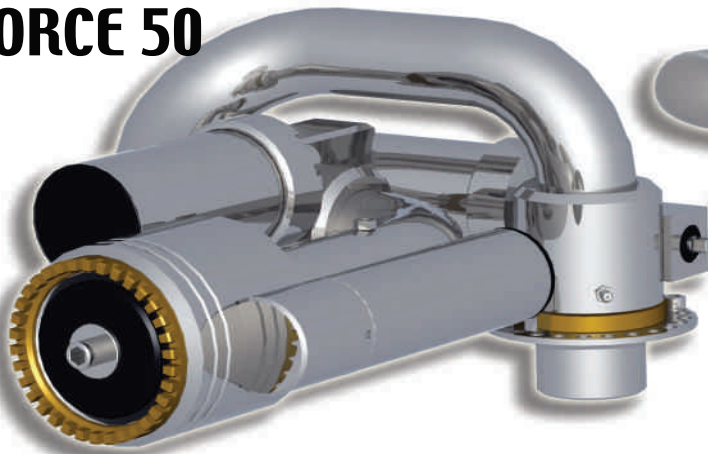


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effective Incident Command System (ICS) or Incident Management System (IMS). One element frequently absent from these models is a comprehensive description of the duties and responsibilities of the Accountability Sector/Division. In the United States, future federal funding will be dependent on the department's compliance with National Incident Management System (NIMS) guidelines in an effort to standardize structure and terminology.

If the duties of the Accountability Sector/Division are not well defined and properly factored into the ICS/IMS structure, Personnel Accountability may suffer. If the sector/division is well defined and structured, training and evaluation will be relatively easy.

### Step 3 – Train on Personnel Accountability

Every day, training sessions are held on a variety of subjects and practical evolutions. It is not unusual to drop by the fire station and find a drill in progress on advancing hoselines, raising and lowering ladders, hydraulics and pump evolutions, emergency medical care, etc. It is very unusual to find a department that aggressively and regularly trains on Personnel Accountability.

Personnel Accountability must not only be viewed as a concept or philosophy, it must become a skill. Just like any other skill employed in the fire/rescue service, it needs to be practiced regularly, both in training and on “routine” incidents. First responders and command officers must become knowledgeable and proficient in their respective roles and responsibilities under the Personnel Accountability procedure. Practical training evolutions and simulated fire responses must be employed to hone this skill to maximum sharpness.

### Step 4 – Stress Crew Integrity and Operational Discipline

Crew integrity and operational discipline together comprise the glue that holds the entire personnel accountability effort together. Without these ingredients, even the most comprehensive personnel accountability procedure will fall apart. The accomplishment of the major fireground objectives – rescue,



*Stand-alone automatically activated standard PASS alarm*

exposures, confinement, extinguishment, and overhaul are all based on the crew concept. It is the company officer's responsibility to keep his or her crew together in order to accomplish these objectives.

Here are some important elements that foster crew integrity and operational discipline:

1. Train officers to give notice when they are moving their crew from one location to another.
2. Train firefighters to stay with their officer. If a portion of the crew is ordered to another location to perform a certain task, they should perform the task and report back to their officer, prior to engaging in other operations. The officer can then keep track of his or her personnel.
3. Outside crew members should report as soon as tasks are completed. If the

driver and ladderman on the truck company are assigned to raise ground ladders, they should report directly to their officer prior to engaging in any other operations.

4. Heavily stress the importance of having responding command officers, personnel on units returning from another call, and home response personnel report to Command and the Accountability Sector/Division prior to engaging in operations.

Following these basic guidelines, and tailoring the mechanics to suit your department's SOPs will enhance your firefighting efforts as well as ensure accurate personnel accountability.

### Step 5 – Include a “Roll-Call & Search” Procedure

Having an established Personnel Accountability procedure, and training on that procedure accomplishes the first half of the accountability objective. Understanding the roles and responsibilities and practicing the skills associated with your procedure will allow the Incident Commander to know who's operating on the incident scene. If there is a catastrophic event, such as a building collapse, the Incident Commander can use the information provided by the Accountability Sector/Division to determine which personnel are accounted for and which are “missing”.

The “Roll Call & Search” procedure should describe those actions that are to take place if one of the following events occur:

1. A major catastrophic event (total or partial collapse, explosion, flashover, etc.).
2. When a person is unaccounted for, or has not checked in with his or her officer after performing an assignment.
3. Prior to changing the operational strategy (moving from offensive to defensive tactics, or vice-versa).
4. When the Incident Commander or Safety Officer calls for an evacuation of the structure for safety reasons.

These procedures must be clear, concise, and well-defined. The Accountability Sector/Division Officer should coordinate the roll-call when dictated by the events described above.

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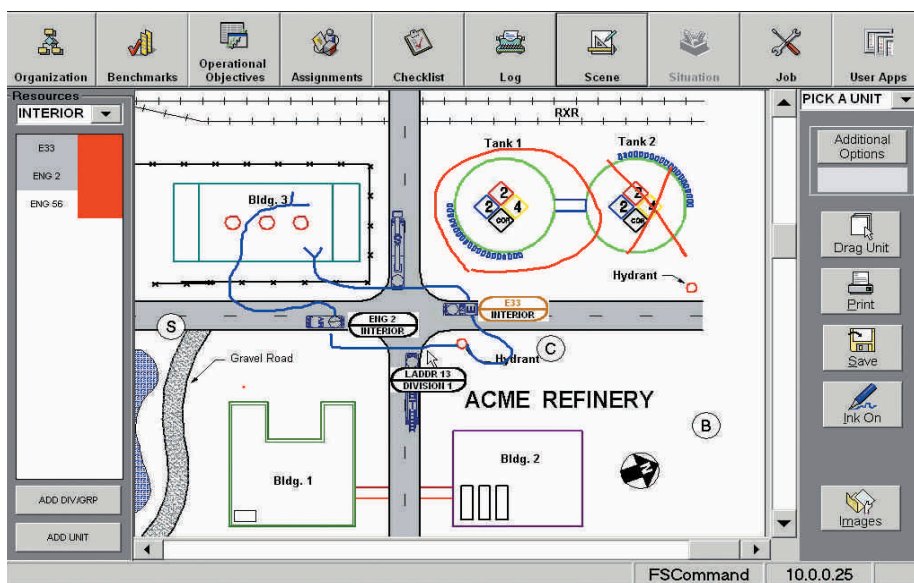
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Display of drawings of incident scene and resource deployment (courtesy of FieldSoft, Inc.)

During a roll-call, company personnel should report to their officer, line officers should report to their sector/division officer, and sector/division officers should report to Command. The accountability information must be based on personal observation.

If it is determined that one or more personnel are missing, RIT must be deployed and an immediate search should be instituted immediately. Company or sector/division officers should report the last known position of those missing, and the search should begin there, starting from the most hazardous location and working outward. All operations, except those essential to the rescue effort or to protect the search crews should be curtailed until the missing persons are located.

Last, but certainly not least, is the incorporation of a universally recognized means of issuing an evacuation order. When the Incident Commander or Safety Officer deems that interior operations can no longer be performed safely, he or she must have the means

to quickly notify all personnel to evacuate the structure. There are many new technologies available that can achieve this electronically, and most importantly, independent of PTT voice radio communications. Once this signal is given, personnel should cease any operation not directly associated with the rescue of civilians or firefighters and evacuate the building immediately.

### Step 6 – Use an Effective PASS System

Personal Alert Safety Systems (PASS) now more than ever are an essential part of an effective personnel accountability system. Most first responders are quite familiar with PASS systems. For those who are not, these devices provide an alarm when a first responder is in distress. The distress alarm can be activated manually, or it will automatically activate an alarm if the wearer is motionless (injured or incapacitated) for thirty seconds. No modern fire department should be without PASS protection!

PASS systems have evolved significantly since earlier models, which were all stand-alone manually activated devices that simply emitted a loud alarm warning when a first responder was in a Mayday situation. Over time, it was recognized that first responders were failing to activate their PASS, and standards began stipulating that the devices must be switched to the motion sensing mode without any independent action by the wearer.

There are several brands available on the market. Most are 'auto-on', which means they are switched to the motion sensing mode automatically. Some are stand-alone, in that they can be used even when not using SCBA, and others are integrated into SCBA systems and activate when the air cylinder is turned on. Newer technologies incorporate radio frequency communications into the PASS, providing automatic notification of a Mayday situation. Some are two-way signaling, and Evacuation signals can be sent to these units independent of PTT radios.

Determine which standard is required in your department (NFPA in the United States, Ex Certification in Europe, CSA certification in Canada). Ensure that the model that you use is third party certified to meet the appropriate standard. You should also test each model, and select the one that conforms to your performance specifications and meets with your approval. Check with other departments in your area to learn which types work well in your department.

In closing, if your department has a Personnel Accountability procedure, keep it in the forefront of your training programs. Refine the accountability skills of your firefighters and rescue workers. Establishing an effective Personnel Accountability program will save lives!

*If it is determined that one or more personnel are missing, RIT must be deployed and an immediate search should be instituted immediately.*

Craig A. Walker is a retired Division Chief who served for 25 years in the Prince George's County, Maryland, Fire Department. During his career, he was heavily involved in safety and health issues, including personnel accountability. He is currently president of Grace Industries – Sales Division.

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# Foam System Design Considerations



By Dominic Colletti

AS A FIRE OFFICER engaged in specifying new fire apparatus, understanding the capabilities of foam systems is important. You need to ensure that the foam system you specify will not only answer the call of ordinary “day-to-day” firefighting duties but also the extraordinary job seen only once in a while – the growing inferno inside a structure that has the potential to be a large financial loss.

Foam system design is important. The first question that needs to be asked is, “What type of foam system do I need to make the most out of what I have?” In other words, what type of foam system (foam concentrate and the hardware to dispense and apply it) will best complement your fire resources: personnel, equipment and water supply?

The purpose of answering the above question is to ensure that you do not end up with a foam system that answers a question that no one asked!

We’ll discuss in this article two fire brigades in the United States who went through the foam system specification process and took delivery of two new fire apparatus. The fire apparatus and foam system they chose may differ from what you may buy – and that is the important point in this article. You are the expert regarding the type of duty and target fire hazards that the foam system will see when deployed in your response district. However, the thought process used by these U.S. brigades to determine foam concentrate needs and hardware will remain the same for you.

Cumberland Goodwill Fire and Rescue and the Union Fire Company are located in the borough of Carlisle, a central Pennsylvania suburban community. They both respond to about 700 to 1000 fire calls per year, and typical responses range from room and content to fully involved dwellings. Automobile

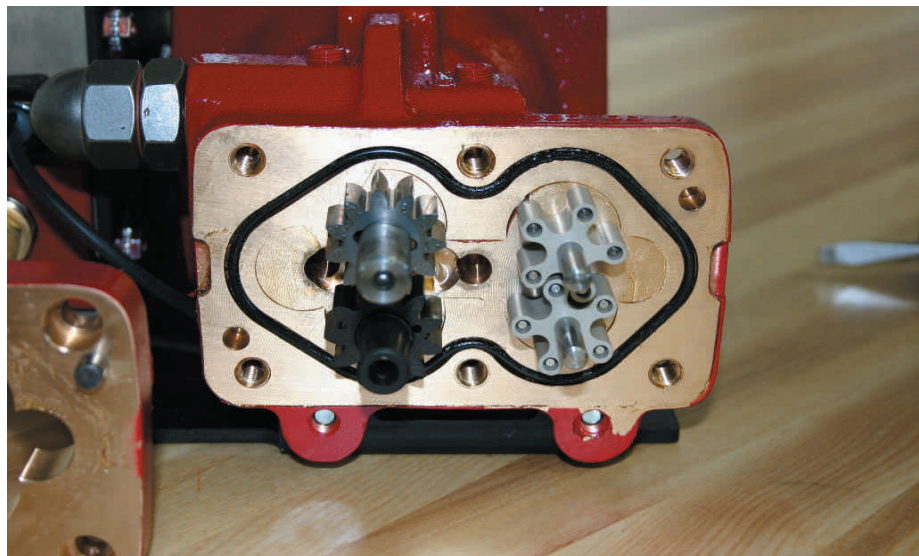
blazes on Interstate 81 and the Pennsylvania Turnpike are also a common occurrence.

During the fire apparatus specification process, they kept the foam system selection strategy simple: install a foam system that would provide the highest fire stopping capability from the apparatus water supply and be simple to operate. The water supplies that they specified on the twin engines are 800 gallon (3,028 liter) booster water tanks and single stage 2,000-gpm (7,570 lpm) fire pumps.

*This Cumberland Goodwill engine is one of two identical units purchased with a electronic direct-injection foam proportioner with a rotary gear foam pump. The engine has two concentrate reservoirs that carry Class A foam as well as AR-AFFF Class B foam*

After thorough review, Cumberland Goodwill and Union carefully selected an electronic direct-injection proportioner with a 5-gpm (19 lpm) rotary-gear foam pump, and a system that carries both Class A (for ordinary combustibles) and Class B (for flammable liquids) foam concentrates.

“We needed to enhance the firefighting capability of our initial arriving personnel at daytime fires,” said Cyle Sheaffer, a live-in firefighter at the Cumberland Goodwill fire station. “The challenge at the top of our minds was to find an



*A look inside a 19 lpm rotary gear foam concentrate pump. These pumps have advantages since they can more readily handle highly-viscous foam concentrates.*





*An operator control digital display. This is the control for the foam system. Concentrate percentage changes are as easy as the push of a button*

easy to use, yet highly accurate foam injection system that would handle our bread and butter responses. More importantly, it also needed to provide high foam solution delivery rates that we absolutely need to stop major working fires. The electronic direct-injection proportioner with rotary-gear foam pump fit the bill perfectly.”

Careful thought went into foam system integration with the fire pump and plumbing systems on both new engines. First off, officers knew they would need to rely on their engine’s 800-gallon (3,028 liter) water booster tank as an initial attack water supply, in most cases.

To discharge foam solution, Cumberland Goodwill installed a foam manifold on the discharge side of the fire pump. The manifold is connected to the following “foam capable” discharges: two 1¼-inch (45 mm) diameter crosslays, a pre-piped deck gun monitor and a rear 2½-inch (63 mm) diameter discharge.

How do these foam capable discharges relate to Cumberland Goodwill’s firefighting strategy and tactics?

“We are probably in the same boat as many other departments around the country. About 90% of our working fires are extinguished using one or two 1¼-inch (45 mm) diameter handlines,” acknowledged Cyle. “We plan to use the 1¼-inch (45 mm) diameter foam capable crosslays for these minor fires.”

“We also wanted to be able to control and suppress the not-so-often large structure fire. That’s why we have the rear 2½-inch (63 mm) diameter foam capable discharge equipped with 200-feet

(61 meters) of 2½-inch (63 mm) diameter preconnected attack hose and a portable monitor. We can quickly and easily deploy a 500-gpm (1,893 lpm) Class A foam solution delivery rate using this monitor.”

“When we are at a serious fire and things get bad, we can still use all three foam capable hoselines simultaneously to move high-volumes of Class A foam solution – up to 1,000-gpm (3,785 lpm).

But some say that Cumberland Goodwill has overdone it with the size and capability of their new foam equipped engines. Cyle has taken some prodding from the brethren in surrounding fire companies.

“I’ve heard some say that, regarding today’s large fire engine sizes and heavy weights, they believe we are delivering ‘fish and chips with cement trucks,’ as an analogy. This is since we are also using the apparatus to perform Emergency Medical functions and run to automatic fire alarms. But what I say is that ‘when you need to pour concrete, you need a cement truck,’” said Cyle.

We have installed this electronic direct-injection system with a rotary gear foam pump because it’s fully capable of handling both the run of the mill and extraordinary high-challenge fire. The parallel is that, with the new foam system we are not only able to handle the every day call for ‘fish and chips delivery,’ but much more importantly we can effectively answer the call to ‘pour concrete,’ when required. It is all about the first arriving firefighters being able to stop a large volume of fire quickly.”

“I figure that after using these units at our first major working fire, the community will immediately see a big payoff in reduced property loss from the investment we have made in these engines,” Cyle decisively said.

What about pump operator training on how to use the foam system? Cyle said that the pushbutton display is easy to operate and reliable. For training, Cumberland Goodwill had a factory representative provide an informative session on foam system operation.

In summary, three key items Cumberland Goodwill considered in specifying their foam system are:

1. They installed a Class A foam concentrate reservoir on their engine. With the push of a button, they can cost-effectively use an agent that multiplies the fire stopping power of their water supplies on ordinary combustibles fuels – wood, trash, tires and structure fire.
2. They installed a Class B foam concentrate reservoir that holds an Alcohol Resistant Aqueous Film Forming Foam (AR-AFFF). This product is available immediately by turning a dual tank reservoir selector switch from “A” to “B.” This provides effective vapor suppression at both ignited and unignited flammable liquid fuel spills, such as may be found at an automobile extrication scene.
3. Their foam system discharge manifold, installed on the discharge side of their fire pump, is connected to not only their commonly used smaller-diameter fire attack hoselines, but large diameter attack hoses also. This provides foam solution delivery rates to stop large volumes of fire.

The foam system that you finally purchase should be “the answer to the questions that you asked.” A few of those are, “What do I need to make the most out of what I have?” and, “What foam system will give me the biggest return on investment from the standpoint of increasing my fire stopping capability?” Answer these questions and you will be heading in the right direction.

Dominic Colletti is the Global Foam Systems Product Manager for Hale Products, Inc. He is also the co-author author of Foam Fire Operations 1 and the Rural Firefighting Handbook. He can be reached at [dcolletti@idexcorp.com](mailto:dcolletti@idexcorp.com).



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# New Fire event to heat up the

23RD JUNE 2005 – Manama, Kingdom of Bahrain. PennWell Corporation, Bahrain Exhibition and Convention Bureau (BECB) and the General Directorate of Civil Defence (GDCCD), announce the launch of an exciting new fire event serving the Middle East. The first "Fire Department Instructors' Conference (FDIC) Bahrain" is scheduled for 6 – 10 May 2006.

FDIC Bahrain is being organized under the patronage of H.E. Shaikh Rashid bin Abdulla Al Khalifa, Minister of the Interior. The event enjoys high-level support both from within the government of the Kingdom of Bahrain as well as from the industrial sector. The Ministry of the Interior and through this the General Directorate of Civil Defence under the leadership of General Abdul Latif Al Zayani has pledged its full support to the event. From industry, FDIC Bahrain also enjoys the full support of BAPCO, the Bahrain Petroleum Company, and Arab Shipbuilding and Repair Yard (ASRY) Bahrain. All three parties are offering full logistical support as well as the use of their excellent training facilities to FDIC Bahrain.

FDIC Bahrain, based upon the proven success of PennWell's global fire events, will be built upon three crucial elements. First, the Hands On Training (HOT) sessions, taking place on May 6-7, will give attendees live situational instruction. In carefully selected locations throughout the city, fire fighters

will learn techniques and practical theory from some of the most experienced internationally renowned trainers, who are being brought to the region specifically for this event. Next, the exhibition, staging on May 8-10, will be the platform for suppliers to showcase their products and services to the fire market of the Middle East. The third element will be the conference sessions, running alongside the exhibition. These will give Fire Chiefs and Safety Managers throughout the Middle East first hand advice on how to deal with the challenging scenarios they face. Each paper in the conference will concentrate on the command and control of a specific major incident, and in all cases will be presented by a speaker with direct operational experience of that particular incident.

FDIC Bahrain will draw together fire fighters from across the Middle East with the express aim of providing them with crucial knowledge, experience and expertise as well as a unique networking opportunity. The main aims of this great profession are the saving of lives



and the safe and effective control of the most dangerous situations. The techniques, equipment and direct operational experience on show at FDIC Bahrain will assist greatly in the realisation of these aims.

The training programme will be developed under the able leadership of former United Nations Fire Chief Robert Triozzi, leader of the Rome based Fire Rescue Development Program, a UN recognised Non Governmental Organisation (NGO). Chief Triozzi, a 30-year fire service veteran, has worked with firefighters in 38 countries on 5 continents and has the distinction of reorganizing, training and guiding fire services in developing and war torn countries, including Bosnia, Angola, Kosovo and Iraq.

Co-Leader is John O'Connell, Lead Instructor at the FDIC events in the USA as well as a fireman of 26 years experience with the Fire Department of New York (FDNY) one of the world's busiest fire departments. Until his recent retirement, John was the most experienced elite "Rescue" fireman in the city, serving with Rescue 3. Both John and Chief Triozzi will be working closely with experienced partners from within Bahrain and globally.

At the inaugural committee meeting, Glenn Ensor, Director of Events PennWell Global Fire Group, commented: "This extension of PennWell's hugely successful fire franchise is an exciting move. This event will bring together the best instructors and innovation leaders

*FDIC Bahrain will draw together fire fighters from across the Middle East with the express aim of providing them with crucial knowledge, experience and expertise as well as a unique networking opportunity.*

# nt in Bahrain Middle East

*Fire fighters gain invaluable training from experiencing realistic tactics and methods in exactly the same situations as they will encounter in their jobs.*

that the global fire industry has to offer. The live Hands-On-Training sessions are so powerful and so dramatic, they will result in the very best training for the region's fire fighters. PennWell Corporation is deeply committed to developing learning and training for fire fighters around the world and we are delighted with the enthusiasm that this launch has already generated".

Regarding Bahrain's position as the location for this international event, Ensor added: "Bahrain is a logical choice of location for FDIC. The comprehensive nature of this type of event requires the full support of the host city and its fire and safety services. From the very beginning, the Kingdom's representatives have recognised the benefits, which FDIC Bahrain will bring to the fire and safety services of the Middle-East. Consequently, all the support we could wish for has been offered and we deeply appreciate the foresight and generosity we have encountered here. Add in the enthusiastic response the concept has received from industry and the right ingredients for success are already in place. Ease of travel to Bahrain, its popularity as a place of business in the Middle East and its proximity to the vast Saudi Arabian market only serve to underline the case for staging the event here".

The PennWell HOT modules are unique in the fire industry. PennWell collects the most experienced fire fighters from around the world and allows them to teach in controlled, live situa-

tions. Fire fighters gain invaluable training from experiencing realistic tactics and methods in exactly the same situations as they will encounter in their jobs. At the same time, instructors can witness fire fighters in live situations and get an accurate feel for how they react. The HOT modules will cover:

- Structural Collapse – Urban Search and Rescue
- Vehicle Extrication
- Tower/High Angle Rescue
- Shipboard Fire
- Ship Engine Room Fire and Rescue Below Deck
- HazMat/Mass Casualty
- High Rise Fire fighting Tactics
- Structural Fire fighting
- Tank Farm Fire Master Stream Application
- Oil Pipeline Blow
- Oil Pit Fire

The exhibition will give the chance for leading suppliers to sell their products and services. Because the vendors are selling to the market face-to-face, they can understand the particular needs and requirements of the region's fire fighters and fire services. The result is bespoke packages for specific situations. Ideal for both buyers and sellers.

The conference will be in the form of classroom-style lectures, where leading thought providers and strategists will

present their analysis of various parts of the industry. This will include both technological and strategic issues. The key issues that face the industry as a whole, regardless of geography, will also be addressed here.

In the Middle East, financial barriers to investment in the best equipment for fire and emergency services are rarely an issue. The real need is for training in, and knowledge of, the best strategies available to the fire fighter on the ground. FDIC Bahrain will meet this need and therefore provide exhibitors with access to a unique audience with a real need for knowledge and technology. The enthusiasm with which FDIC Bahrain has been embraced, both in the Middle East and around the world, gives us a good indication that the event will be both a huge success and a landmark event.

More information can be found at [fdicbahrain.com](http://fdicbahrain.com)

FDIC Bahrain is presented by *Fire Engineering* magazine and managed by the UK based offices of PennWell Corporation, headquartered in Tulsa, OK. PennWell is a diversified multi-media company providing authoritative print and online publications, conferences and exhibitions, research, databases, and Internet-based services to strategic markets worldwide. PennWell's POWER-GEN Middle East event was held in Bahrain in 2004.

Contact:

**Glenn Ensor**

Director of Events  
PennWell Corporation

Tel: +44 (0)1992 656 616

E-mail: [glenne@pennwell.com](mailto:glenne@pennwell.com)





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Peli lights™ are technically advanced lighting instruments, well known for their brightness, durability, and safety features. The complete range includes more than 50 models with alkaline and rechargeable batteries. They come in different sizes and shapes according to user's requirements: handheld torches with lanyards, right-angle torches, tactical lights for quick and intense beam of light, headlamps, high-power professional lanterns, and waterproof diving torches.

### Why choose a Peli™ light?

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**Safety and Quality Certifications.** Peli lights have Safety and Quality Certifications from independent safety organizations from around the world (FM, UL, CSA, USAR, MSHA, etc). In Europe, Peli™ torches have been tested to the highest ATEX Safety Standards by only approved laboratories. Most of them are approved to Category 3 (Zone 2), Category 2 (Zone 1), and Category 1 (Zone 0). This means that Peli™ torches are the most safety-approved lights on the market.

**LED vs. RECOIL LED TECHNOLOGY.** In recent years, LED (Light Emitting Diode) technology has created a revolution within the lighting world. In comparing LED to incandescent lamps, the advantage of the LED is clear: lower lamp replacement cost and longer burn-time. Unfortunately, these advantages are not without their drawbacks as the light generated by an LED is not as bright and focused as traditional lamps. The answer to that is the RECOIL LED Technology developed by Pelican™/Peli™. What differentiates LED Recoil Technology torches from others on the market are their ability to create extraordinary focused beams of light, previously unobtainable in LED torches. The key to this outstanding development is a design that directs all of the 1Watt Luxeon LED light back into the reflector to focus the light into a truly impressive beam of pure white light. When comparing its output to existing multi-LED lights, Recoil Technology generates a beam 33 times brighter. Another great benefit of this new generation of torches is that lamp modules never need replacement.

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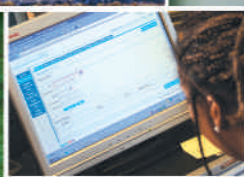


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# Structural Collapse Rescue



By Dave Dickson

BUILDING COLLAPSES ARE NOT uncommon, neither in the United Kingdom or worldwide. Buildings collapse for a variety of reasons. Natural phenomena such as earthquakes, hurricanes, floods, mudslides, avalanches, and storms are the usual cause for multi-building collapses. Single-building events are generally more unexpected, such as the collapse of the department store in Seoul, Korea (June 1995), due to design and construction defects, and the World Trade Centre Towers in New York City (September 2001), due to a terrorist attack.

The operations at the Pentagon and in New York City in 2001 demonstrated that a great deal of knowledge has been gathered and specialised techniques have been developed from the time of the Mexico City Earthquake. Furthermore, formal urban search and rescue networks have been established. One such network is the International

Search and rescue operations in partially collapsed buildings pose danger to both victims and rescuers because of the potential instability of the remaining building and the rubble's uncertain stability and strength.

*The goal of the rescue mission is to retrieve trapped victims while maintaining the safety of rescue personnel.*

## A BRIEF HISTORY

The devastating 1985 Mexico City Earthquake is often cited as the genesis of Urban Search and Rescue (USAR), for it was the first international rescue event where the problems of search and rescue in large buildings were addressed on a grand scale. During the emergency response effort, most people attempting to rescue victims from the collapsed concrete buildings were untrained, and this situation resulted in the death of some would-be rescuers.







Search and Rescue Advisory Group (INSARAG), which represents USAR teams willing to respond to other countries. The United Kingdom is a member of INSARAG and the UK Government is represented by the UK Fire Service Search & Rescue Team (UKFSSART).

#### THE NATURE OF STRUCTURAL COLLAPSE

When a building collapses, it generally does so in one of two ways. The building can be thought of as having

“exploded” or “imploded”. The primary difference between the two types of collapse is the direction of force as it applies to the materials contained in the structure. The type of collapse will also determine the amount and density of the debris that is involved in the rubble pile.

With implosion, the building will collapse into itself. It is a technique that is used by demolition specialists to minimise the spread of debris when purposely demolishing buildings. This

type of collapse is likely to be caused when interior weight bearing structures lose their integrity and subsequently “pull” exterior walls into the centre of the mass. The density, and generally the depth, of debris are greater when a building is said to have imploded. The density of the rubble also increases in a direct relationship to the original height of the building.

In the case of explosion, caused by an outward rush of force caused by natural, mechanical, or chemical forces, the building will collapse in an “outward” direction. It is likely that the debris will be more widespread in the vicinity of the collapse, and that they could be of lesser density and depth. A terrorist bomb can scatter building parts for several hundred feet or even farther, when it causes a building to collapse. It is possible that victims could be buried under debris a greater distance from the centre of mass.

#### HAZARDS AND RISKS

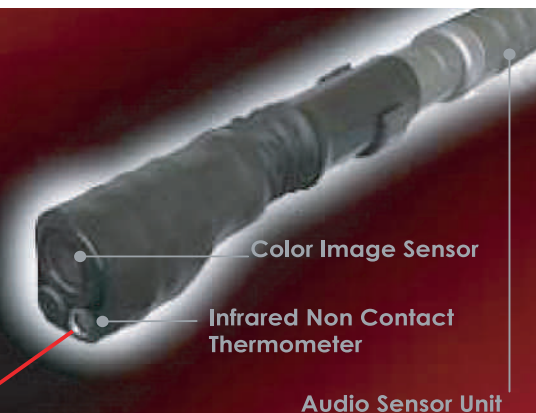
Partially collapsed concrete and steel frame structures are probably the most dangerous building types in which to

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Fire  
Contact with moving vehicle or machinery  
Dust  
Sharps (debris/glass)

perform search and rescue. These typically large and heavy buildings are difficult to shore and are prone to sudden, catastrophic failures, giving those inside little warning to evacuate. Rescue workers must also consider other hazards besides a building's structural elements.

It must be understood that minor hazards become severe health risks after a structural collapse. For example, emergency lights become corrosive pools of acid, yet only appear as wet spots on walls. The thick dust potentially contains silica, asbestos and many micro-organisms that have been safely buried since the building was constructed just waiting to find a nice warm moist home in your lungs. Water and sewage systems, electrical wires, and hazardous materials, among others, may pose danger. Some of the would-be rescuers in Mexico City drowned in the basements due to mains water leaks.

*One of the biggest concerns during any rescue operation is the level of acceptable risk.*

Defining the level of risk to the rescue team, and the trapped victims, is not a simple task. The various disciplines involved often differ on matters of relative risk. To further complicate matters, the level of acceptable risk changes as time passes from the onset

of the event; as the chance of finding live victims decreases so should the level of risk that rescuers are prepared to accept.

## CONTROLS

The hazards at a collapsed structure incident are many; indeed it is one of the most hazardous of rescues. To maximise the safety of rescuers requires a number of 'controls'. These are:

- **Information** – knowledge of the hazards and techniques to be used,
- **Procedures** – to ensure a professional, deliberate and structured approach to the incident,
- **Supervision** – a command & control

structure that can bring order out of chaos and provides a safety-based work environment,

- **Risk assessment** – the hazards are identified, controls put in place and the work system reviewed regularly,
- **Training** – all rescuers should be trained in techniques, hazard awareness, procedures and equipment operation,
- **Equipment** – technically advanced equipment will maximise the chances of success whilst minimising risk to the rescuers,
- **PPE** – all rescuers must be adequately protected – the 'safe person' concept.



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## PANCAKE COLLAPSE



## 'LEAN TO' COLLAPSE



## 'V' COLLAPSE

### RESCUE FROM COLLAPSED STRUCTURES

As many as one third of all building collapse victims, that are rescued, are found in spaces created by the way that building materials generally fall. Most of the collapse configurations that occur (displacements, lean-to, V-collapse, pancake) create "voids" in

which people may be trapped and remain alive.

The dilemma facing many fire and rescue services is that of balancing speed and safety. Clearly, whilst a 'New York' situation must be avoided, any casualties still alive after the initial collapse will benefit from a rapid rescue. This places an obligation on the rescue

services to act effectively and will require committing personnel before all safety measures are put in place.

To assist Incident Commanders achieve this balance and to maximise rescue efforts whilst minimising risk, USAR responders have developed a Tactical Plan termed the 'Six Stages of Rescue'.

### THE SIX STAGES OF RESCUE

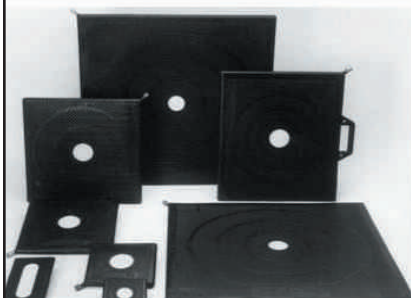
The 'six stages of rescue' provide a framework for the organisation of any collapsed structure incident. It is internationally recognised and is used by a number of organisations including teams from America, Israel, South Africa and Australia. The UK has developed this concept and adapted it for use within the Incident Command System (ICS) operating in the UK Fire & Rescue Service.

Whilst it is likely that there will not be a clear delineation between each stage and there will be times when stages overlap – the incident command structure must ensure that each stage is undertaken and completed. This logical and progressive approach will mean that rescue personnel do not become

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**STAGES OF RESCUE**

Stage 1 – Reconnaissance

Stage 2 – Elimination of Utilities

Stage 3 – Primary Search

Stage 4 – Exploration of voids

Stage 5 – Access

Stage 6 – Terminate

R . E . P . E . A . T

drawn into a difficult and protracted extrication of one individual when nearby there are twenty people only trapped by a wedged door. It is imperative that a cost/benefit analysis drives the decision making process, particularly in the early stages of an incident and the rescue services must be prepared to accept the fact that they may not be able to rescue everybody.

Progression through the six stages will take a considerable time even at a small single dwelling collapse. Tactical planning should take account of this and the resources required to achieve a safe and successful conclusion to the incident. Pre-planning must take account of the equipment and techniques required, the training implications that result and the overall supervision and control of the incident.

There is no quick solution to the problem – purchasing search cameras or concrete drills will not make any fire or rescue service competent to deal

with collapsed structures even on a lesser scale than that witnessed in America in 2001. The only way to ensure a safe and effective operational response is by the development of a properly equipped, appropriately trained and well managed body of specialist rescue personnel. This group must be seen as an integral part of a response system, not outsiders seeking to take over operations. They themselves must be willing to support and develop the skills and knowledge of others within the wider emergency service response and in this way the cause of safe and effective structural collapse operations will move forward.

Dave Dickson is a serving fire and rescue officer in the United Kingdom. He has been involved in 'specialist' rescue for more than 15 years as a member of the UK international search and rescue team. Since 2001 he has been involved in a Government project that is developing the operational response and consequence management of large-scale incidents including structural collapse. He contributes to the development of international USAR cooperation and standards through his work with UK Government, INSARAG and the European Union.



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# SCOTT EXPAND WITH AIR OF CONFIDENCE

Scott Health and Safety is expanding elements of its international product range into Europe, the Middle East and Africa with the introduction of its proven line of stationary and mobile compressor air systems for the fire service and general industry.

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The product line being introduced includes the Hush Air Compressor – one of the quietest compressors on the market – and the revolutionary RevolveAir® SCBA charging station. Scott's breathing compressors combine high performance with ease of operation.

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Each system is precisely sized to maximise individual compressor performance of each and comes complete with moisture separator, purification chambers, pressure gauge, safety relief and back-pressure valves.

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The Hush Air compressor works in tandem with one of the fastest fill stations on the market – the RevolveAir® charging station – which offers personnel time savings over competitive units with 33% faster fill capacity.

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The RevolveAir® has undergone rigorous testing, including a third party certification to meet the US NFPA 1901 requirements. Certification included the successful containment of a ruptured 2460 litre cylinder, exceeding U.S. NFPA standards by over 25%.

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## About Scott Health & Safety

Scott Health & Safety, a unit of Tyco International Ltd.'s Fire & Security segment, are innovative specialists in the manufacture and design of respiratory, head and sensory personal protective equipment and other safety devices for fire & rescue services, industrial workers, police, military and civil defence organisations around the world.

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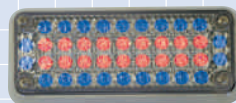
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# Digital advantages o



*Pic courtesy of Savox Communications*

TODAY WE HAVE IN EUROPE, North America and Asia Pacific different setups for communication on the local fire grounds and rescue scenes. Europe has for some time been well prepared for fire ground communications. Typically for an European fire brigade is that personal or work shift radios have been in use. The northern American fire brigades are more reliant on voice amplifier systems, amplifying the speech whilst using a breathing apparatus facemask (SCBA). The Asiatic region is much more in a development phase, at this point looking for their way of communicating on the fire grounds.

The similarity for all of the different corners of the world, has been the analogue radio networks that have been/still are in use in some regions. These networks have been single-user-group networks, with included and added costs for Public Safety radio networks one for every "Blue-Light" organization. With this setup there are always the issue of the different radio networks, and users not being able to communicate with any others but members of the same user organization. In today's world this can create difficult situations for our *everyday heroes*, resulting in loss of life or tremendous loss of property.

**Fire ground communications have stayed the same for decades.** There is a call for a new and more efficient way

of solving the communication issues for the rapid response personnel, involved in rescuing peoples lives and saving property. Today there are new and reliable technologies available to revolutionize the radio communication on the fire grounds. The way forward is the digital radio networks! The digital networks provide new and unheard of ways, to get the different "Blue-light" organizations, interconnected and co-operating, in today's changing needs for instant communication and support between these public authorities.

In London on the 7th of July 2005, we could all follow the London Metropolitan Police, London City Fire Brigade and Ambulance Services doing a huge effort saving the victims and injured

**By Mikael Westerlund**

people in the Underground bombings. London Metropolitan Police is today using the Airwave radio network ([www.airwaveservice.co.uk](http://www.airwaveservice.co.uk), a public authority network based upon the TETRA technology, TERrestrial Trunked RAdio, [www.tetramou.com](http://www.tetramou.com)). Similar public authority radio networks are in operation in Finland, Belgium, Netherlands, and are planned in other parts of Europe, Asia and the US. One of the main advantages with this type of open standard authority networks is that multiple suppliers are available both for terminals and infrastructure. The multiple supplier base gives a better drive for technology advances and price reductions, on both terminals as infrastructure.

**How to make the most out of your digital radio terminal?** Not only does the new digital terminals give crystal clear voice communication in comparison to the analogue terminals, but allows manufacturers to develop new and exiting applications based upon the data transmission capabilities of these digital terminals. Main part of the current TETRA portable terminals today offer even a positioning application, providing location information both for the terminal user as well as the command and control center. The terminals positioning services are based upon GPS technology. With today's technology for positioning, the accuracy still does not provide sufficient information for indoor use. To be able to utilize positioning services indoors, technology again must take a new step forward.

Solution providers such as Zenitel have created some very interesting applications for today's rescue organizations. One of the products that have been created together with the end user organizations, Fire & Rescue Services is a new type of remote speaker microphone (lapel-mic) that has as the first product on the market the capability of sending preprogrammed data messages (based upon the Short Data Service, SDS, in the TETRA standard) and an Emergency call sequence (sending an emergency call in a sequence, transmit/standby). This remote speaker microphone can operate as a standard remote speaker microphone (lapel-mic)

# n today's fire ground

or as a Push-To-Talk unit for a headset, for these digital radio terminals. Depending on the rescue operation and need from the user this unit gives full modularity needed. The data messages can be predefined in a simple computer software and the user organization can define the meaning of these messages beforehand. The utilization of such messages can be used to give the command and control center information of the individual rescue worker/police officer. Some of the most common predefined SDS messages so far have been: on scene, need assistance, need for Police backup, Ambulance required, Doctor needed and Rescue helicopter needed. The SDS messages that are predefined on the command and control center geographical information software (GIS), then gives the operator on the command and control center, instant information from the rescue officers on the scene. No more need for long voice discussions and argumentation of blocking radio channels, with the command and control center. The Emergency call sequence can be programmed and tuned for the specific needs for the user group in question. Such parameters as transmission time, delay, background alert signal and sequence length can be programmed by the same simple computer configuration software as the SDS messages. With an ingress protection classification of IP67 (submersible to 1m) this unit truly sets new trends for rugged communications on today's fire grounds. As a wide range of different headset configurations are supported by this remote speaker microphone, all equipped with a rugged quick release connector, fulfilling military standards again provides a new level of product durability to products used by the heavy users and environments of Fire fighters across the globe.



Pic courtesy of Savox Communications

**Digital radio terminals is not the only way of digital improvements on the fire grounds.** Digital technology has made quantum leaps during the past decade, we have all participated in the technology drive on personal mobile phones. The technology drive on mobile phones has created new technologies that now are making an entrance on the public safety market as well. The digital radio terminals today provide some digital speech enhancement. However, the most revolutionizing product with powerful digital speech enhancement, is the new Dräger FPS-com. Dräger Safety introduced this new product at the Interschutz 2005 Fire and Rescue exhibition in Hannover, Germany. The Dräger FPS-com is an integrated communication product for the new Dräger FPS-7000 series of breathing apparatus facemasks. With its integrated voice amplifier, radio communication with digital speech enhancement, is this new product definitely a new way of looking at and solving the communication issues whilst using a breathing apparatus facemasks. The benefits of this type of new technology is that the sound of the exhalation valve and background noise can be filtered out, hence nothing but crystal clear speech can be transmitted on the radio channel, or amplified for close range communication using

the voice amplifier functionality. The Dräger FPS-com is a very modular product that provides an upgrade path for the users, one can start with buying only the voice amplifier system and later on if required, a radio communication system can be added as an upgrade kit. There are different versions of radio communication options available, either the Push-To-Talk (PTT) can be located on the facemask communication unit itself, or a big body Push-To-Talk can be used, based upon the user preference and fire fighting tactics.

**What are the new features in the next years to come?** As digital applications are making an entrance on this very difficult and challenging ground with extreme circumstances, integration will be the big thing. Already today we find that Heads-Up-Displays (HUDs) are mandatory in the US, displaying the capacity left in the oxygen cylinders. Soon the amount of information that is made available on the HUD will be increased, the information can be displayed on the facemask visor or directly on to the eye retina. So what can be displayed? What about environmental heat information, either as a heat flow picture based upon infrared information or as degree display. Life existence information, giving indication if living victims are within a close range. Explosive gas alerts. Three dimensional pictures of the building complex. The list goes on and on, only the imagination of developers of this type of products along with the honest feedback from the user field is today the limitation of what can be done.

*Soon the amount of information that is made available on the HUD will be increased, the information can be displayed on the facemask visor or directly on to the eye retina.*

The technologies are today available that make the work of our everyday heroes safer, easier and more efficient. So, why not make use of the latest and save more lives?



# CRASH RESCUE EQUIPMENT SERVICE, INC.



*Rosenbauer-Lockheed Rhino*

Crash Rescue Equipment Service, Inc. was established in 1967 as a service company to support the new generation of Aviation Rescue Fire Fighting vehicles (ARFF). In the early 80's Crash Rescue developed a remanufacturing program to give users an alternative to new vehicle replacement. This allowed the users to contain operating cost and implement updated technology that was not available from the Original Equipment Manufacturers (OEM). Today these services are still a strong part of our core business. We currently have a multi year contract with the United States Air Force for frame-up remanufacturing of all of their fire fighting vehicles. We also have on going contracts with the US Marine Corps as well as the Army and Navy for remanufacturing of their fleet of P-19 vehicles. Crash Rescue operates a 110,000 sq. ft. manufacturing facility on 23 acres in Dallas, Texas that will soon be expanded to over 200,000 sq. ft.

Crash Rescue is also a pioneer in developing and improving agent application

technologies for the ARFF industry. Our Snozzle® is the industry standard for extendable turrets with over 300 units in service worldwide. Each Snozzle® features the latest in hydraulic and electronic technology applied in a user friendly format. Computerized simulators are provided as a training aid for operators to hone their skills. A new version of this product was recently introduced featuring 65 ft. elevation and dual nozzles.

The Rhino® is a bumper mounted movable primary turret that features high flow near ground level for better operator visibility and improved fire fighting efficiency. Today Crash Rescue offers a complete line of primary and secondary roof and bumper turrets, extendable roof turrets and moveable bumper turrets. The new turret technology is accompanied by the latest agent management monitoring systems and FLIR camera technology.

New developments in nozzles and agents are now being integrated into Crash Rescue's turrets. The first nozzle advancement was the introduction of Hydro-Chem™, an encapsulated dry chemical nozzle. Instead of having two separate nozzles (one for water/foam and one for dry chemical), Hydro-Chem™ combines these functions. Encapsulating the dry chemical within the water/foam stream allows it to be transported greater distances and be applied precisely on the fire. Conventional fog/stream nozzles have been reconfigured to produce a flat pattern dispersed stream. This helps prevent disturbing the fuel surface as the foam is applied. Compact air aspirated nozzles have been designed to provide effective air injection while significantly reducing the size and weight of the turret. Compressed air foam systems also

require unique nozzle designs. Compressed air foam requires a non restricted straight bore outlet to prevent striping away of the air bubbles. Crash Rescue has designed combination nozzles that allow for both conventional foam and compressed air foam discharge or encapsulated dry chemical and compressed air foam.

Future nozzle designs will be available for multi-agent applications such as combinations of water, foam, dry chemical and fire fighting gas (Halotron, CO<sub>2</sub>, etc.). New technology is now being developed and tested to utilize ultra fine water mist. Crash Rescue is in the forefront of designing the turrets and nozzles required to apply these agents.

Crash Rescue is an industry leader in developing small multi-agent trucks for use at smaller airports or as rapid intervention vehicles at larger airports. Crash Rescue has designed combinations of the latest technology such as high energy cold compressed air foam, dry chemical, Halotron, high pressure misting, etc. into small, highly maneuverable vehicles that demonstrate four times the fire fighting capability of conventional twin agent trucks.

Crash Rescue's Fire Wagons division designs and builds customized trailers for Incident Command, Haz-Mat, Foam and other special fire fighting operations. Trailers feature tubular steel frames and aluminum skin plus heavy duty components designed for emergency response. Both bumper pull and gooseneck designs are utilized by state and local authorities for Homeland Security operations.

Crash Rescue prides itself in the application testing of all new products. We have an eight acre off-road test track at our facility for vehicle evaluation. We also work closely with the Air Force Research Laboratory, FAA and university test facilities (Texas A&M, LSU, etc.) to make sure the new technologies are user friendly, are effective in maximizing fire fighting efficiency and meet the needs of the fire fighting community.

Crash Rescue Equipment Service, Inc. is continuing to advance fire fighting technology around the world to meet the challenges facing the fire fighting community.

For more information contact:  
**Crash Rescue Equipment Service, Inc.**

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FIBERS



By Johnny Ho

FR Viscose © by Hermann Kollinger OÖLFV

**DURING THE PAST FORTY YEARS**, many flame-retardant fabrics have been developed for use in fire fighting clothing. In fact, the demand for flame resistant (FR) fabrics has increased drastically in the Asia Pacific region due to the following phenomena. The economic advancement has transformed many places in the region into populated and industrialized zones, where countless high-rise buildings have been erected in major cities. In addition, more and more world events are being hosted in the region. This has caused an increase in international travelers and tourists, which in turn has led to more stringent demand in public safety services.

As a result of increasing safety consciousness, the Protective Clothing standards have been revised and upgraded, which are mainly based on the international standards such as European Standard EN 469 and the US Standard NFPA. In order to learn what kind of fabrics is used in fire-fighting clothing, it is necessary to understand the structure of the garments.

Basically, a fire-fighter protective garment, which is also called turnout gear, has four layers, including outer shell, moisture barrier, thermal barrier, and lining. The outer shell provides protection from flame and heat. The moisture barrier, which is next to the shell fabrics, acts as a protector from

steam and harmful chemicals. The third layer, which is a needle-punched felt or non-woven fabrics, acts as an insulator against heat conduction. The lining is the inner layer for providing comfort to the wearer. Normally, the lining is quilted with thermal liner. For wildland fire fighting, a single layer protective garment is normally worn over a station uniform.

The basic prerequisite for a fabric to be used in making fire suit must be flame resistant, does not melt or drip. A FR fabric has to extinguish in less than 2 seconds after flame and burn less than 6" char length according to the ASTM specification D6413 Standard Test Method for Flame Resistance of Textiles (vertical test) or flame spread

test EN 532. In NFPA standard, all fabric materials shall have an average char length of not more than 4".

Beside flame resistance, an outer shell fabric has to have certain physical properties with or without external stress such as heat. Those basic safety requirements are residual strength, heat resistance, tensile strength, tear strength, surface wetting and dimensional change.

As required by European Standard EN 469, residual strength has to be equal or greater than 450 Newton (N), which measures the tensile strength of outer shell when having exposure to heat according to EN 366 Method A at 10 kw/m<sup>2</sup>.

Any fabric to be used in turnout gear, it is necessary to pass the heat resistance test, where an individual fabric sample is placed in an oven heated to 260°, and the fabric shall not melt, drip or ignite. The shrinkage shall be equal to or less than 5% according to the requirement specified in Annex A of EN 469.

According to the EN 469 Standard, the tensile strength and tear strength of the outer shell fabrics have to





Iso-Dri Pic courtesy of Lion Apparel

be greater than 450 N and 25 N respectively. Dimensional change should be within  $\pm 3\%$  after 5 cycles of washing with the procedure specified in ISO 5077. For moisture barrier cloth, there shall be no penetration by liquid chemicals to the innermost surface; and 80% of the liquid chemicals shall be running off from the laminated cloth. Moisture barrier is also required to be tested with hydrostatic pressure for NFPA Standard, which shall have a minimum water penetration resistance of not less than 1 psi for 5 minutes

and 25 psi when tested according to Method 5516 and Method 5512 respectively as listed in the NFPA standard.

Fibers and yarns are the building blocks for FR fabrics. Fabrics made of treated cotton were widely used in protective clothing before high performance fibers were introduced. Currently, personal protective clothing made of treated cotton fabrics are still used by some countries in wildland and structural fire fighting as well. However, the retardant chemical being coated on the cotton fabrics could be washed away in one wash, if proper detergent is not used.

The advance in technology has allowed us to develop inherent FR fibers in several approaches. First of all, all man-made fibers are made from polymer. The polymer can be made less flammable by both physical and chemical means. In order to change the burning properties of an existing fiber, flame retardant agent is added in the polymer prior to its formation into filaments. The original properties of the fiber will not be changed, which can be polyester, viscose or acrylic.

The second approach is to develop a completely different fiber called High Performance Fibers, with new molecular structure and properties. PBI (Polybenzimidazole), Aramids and Polyamide-imide all fall into this category.

The third approach is to increase the flame resistant property by partially carbonizing the fiber, such as carbonized polyacrylonitrile (PAN).

Each fiber has its own decomposition temperature and combustion or ignition temperature. When temperature reaches a particular ignition point, the fiber will burn. Both heat and oxygen are required for combustion to take place. In order to determine the flammability of a fiber numerically, a testing process known as Oxygen Index Methods has been developed, which

measures the minimum oxygen percentage required in order to support combustion of the fiber within a controlled atmosphere. This quantitative value is called limiting oxygen index (LOI), which is commonly reported as a percentage. A textile will burn easily with a LOI less than 21%, since air contains about 20.95% oxygen by volume. Untreated cotton and viscose will burn easily in air since their LOI is about 20%. Most of the man-made FR products have a LOI equal to or greater than 28% such as FR Viscose, which has a LOI of 28%.

However, the flame resistant property of a fabric is not solely determined by the LOI of the constituent fiber. The fabric weight, fabric construction and pile or no pile surface all greatly affect a fabric's flame resistant property. The integrity of the fabric after exposure to heat and flame is also important since the fabric may start to decompose before ignition.

There are many FR fibers available in the market with different trade names. The best-known fibers for fire-fighting clothing fabrics in Asia Pacific region are PBI Nomex, Kermel, and Kanox.

PBI was originally developed for the NASA space program, which is an extraordinary organic fiber. It will not burn in air, emits little or no smoke and does not melt or drip. Even after rapid heating to 400°, tensile strength remains at almost the same level. Unlike other high performance fibers, it has good textile properties. Its elongated cross section is similar to cotton, but it has a moisture regain around 15%, almost 50% higher than that of cotton under the same condition. This moisture regain is at a molecular level. Fabrics do not absorb water at a higher rate than other FR fabrics. And it has outstanding resistance to chemicals, solvents and fuels.

Protective fabrics made of PBI fibers, such as 200 gr/m<sup>2</sup> PBI Gold light weight shell fabrics which are a blend of 40% PBI and 60% high-strength aramid fibers, and exhibit a very high residual strength property which is about 4 times higher as required by EN469 Standard. And PBI Gold retains its softness even in a charred state. The fabric will not shrink and will not become brittle after exposure to flame and heat. This property will provide a better protection from flash over. Due

*In order to change the burning properties of an existing fiber, flame retardant agent is added in the polymer prior to its formation into filaments.*

*Some Asian countries such as China and South Korea are beginning to develop their own facilities by producing FR fibers or FR fabrics in order to meet their domestic needs.*

to the high moisture regain of PBI Gold fabrics, PBI fire fighting clothing is comparable to cotton in comfort, which also contributes to excellent static dissipation. Since 1983, PBI has been widely recognized as the premium product in outer shell and hood protection.

Nomex was introduced by DuPont in 1961, which is a registered trademark for DuPont's meta-aramid staple fibers, filament yarns and FR fabrics. Since then it has been used for station wear, coverall and fire fighting clothing. Nomex fiber has excellent thermal stability and does not melt but decompose at 371°C. Nomex III, a blend of 95% meta-aramid fibers and 5% high strength para-aramid fiber, offers high strength fabric, which resists most chemicals and acids. Delta T is another product currently found in the Asian market, and is a blend of 75% Nomex, 23% para-aramid and 2% carbon fiber.

Kermel was developed in France by Rhone Poulenc in the 1960s. Before 1984, it was only available to the French armed and police forces. Kermel is made of polyamide-imide and belongs to the same family of meta-aramid. Since Kermel is a smooth-surfaced fiber with an almost circular cross-section, it gives a softer hand when comparing to other aramid fabrics. It also resists chemicals with high resistance to abrasion, and the fabric has a thermal conductivity twice as low as any other fabric made of aramid fiber. It resists up to 250°C for a long duration.

A fabric has been developed for higher breaking, tearing and bursting strength by using the Kermel HTA core yarn. The Kermel HTA core yarn is made by wrapping para-aramid yarn with the Kermel fibers in order to increase thermal resistance and strength.

Kanox is a pre-oxidized fiber, which involves a process to partially carbonize

the Polyacrylonitrile fiber in order to make it flame resistant. The fiber also resists chemicals, infrared ray, molten metals and with good thermal stability. Kanox is a registered trademark for Taiwan KK Corporation. Carbonized Polyacrylonitrile starts decomposition at 300°C, although spontaneous decomposition does not take place until the temperature reaches 550°C. Protective clothing made of Polyacrylonitrile fabrics can be exposed to relatively high temperature for a short period of time.

Beside outer shell fabrics, the FR fibers also play an important role in the inner layers of fire fighting clothing. Breathable waterproof membrane is often laminated on non-woven FR fabrics, which are made of FR fibers. Gore-Tex's Fireblocker, Airlock and Crosstech are widely used as moisture barrier in which they are laminated with ePTFE membrane. Gore-Tex has developed a fabric known as Airlock by putting thermally stable and chemical resistant spacers made of foamed silicone on the back of ePTFE membrane, which is a unique combination of thermal protection and moisture barrier. The Gore-Tex Airlock fabric creates an insulating air cushion in order to provide thermal protection. SympaTex also makes moisture barrier with Polyester film, like Crosstech, which is also non-permeable for blood, virus and bacteria.

Lenzing is the major producer of FR Viscose, which normally is blended with Nomex fiber for making lightweight fabrics. The blended fabrics are used as pocketing, facecloth or lining in Protective Clothing.

FR fabric manufacturers are trying to offer more colors in order to meet the specification of the fire brigades in different countries, and fabrics will be finished with new process and technology



PBI Gold Pic courtesy of Celanese AMI

such as Nanotechnology in order to provide water repellent and durability. There are a lot of FR fabrics that have been developed and are based on the fibers being mentioned in this article in different structure and weave. As the demand of FR fabrics for personal protective clothing keeps on increasing, some Asian countries such as China and South Korea are beginning to develop their own facilities by producing FR fibers or FR fabrics in order to meet their domestic needs.

In conclusion, there are a variety of fabrics that can be used in fire-fighting clothing, however, safety is the major concern and should not be compromised when choosing for the right fabrics.





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Pictures : West Yorkshire Fire Service



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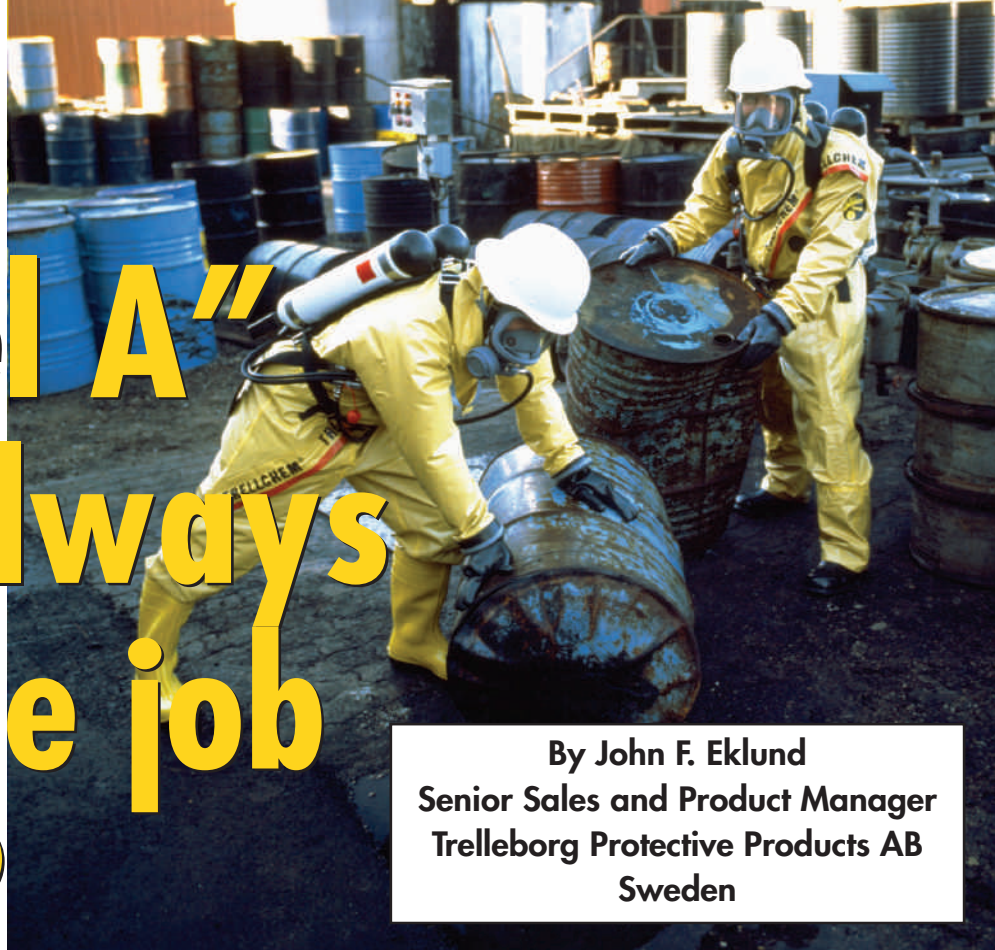


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# Will a “Level A” Suit always get the job done?



By John F. Eklund  
Senior Sales and Product Manager  
Trelleborg Protective Products AB  
Sweden

*Pic courtesy of Trelleborg*

CHEMICAL PROTECTIVE SUITS (CPS) as we know them today owe their origins to the results of NBC development programs for military use. These types of NBC protective suits have been further developed and modified so as to be suitable for use in civilian applications by first responders, fire and rescue services, civil defence personnel, anti terrorist teams, police and other governmental agencies as well as within the industry.

Today the civil versions are also widely used by the military or other defence related services for the purpose of bomb disposal, demilitarization programs, including the disarming of weapons of mass destruction, anti terrorist programs, refuelling of rockets and similar tasks.

The main purpose of chemical protective clothing (CPC) is to protect the wearer from direct skin contact with hazardous substances in their various forms.

It is a complex task to select a CPS even if we today are supported in this process by various standards, such as the American NFPA 1991 and the European EN 943. However there are many other factors than standards to bear in mind in a selecting process – among others:

- Regulations, directives and standards (to be considered).
- Level of protection factor (PF) (to be established).
- Type of job, such as rescue, salvage, military etc.

- Type of CPS, such as “Level A, B, C or D”.
- Totally encapsulated (coverall) or non encapsulated designs of CPS.
- Reusable or disposable/limited use type of CPS.
- SCBA on inside or on outside of the CPS.
- Breathing air supply by external source or by SCBA only.
- Environmental impact, such as temperature i.e. risk of heat stress or frost bite, confined space entries etc.
- Requirement of additional protection, such as flame or cryogenic over covers.

The classic codes of suits i.e. “Level A, B, C, and D” are often used and unfortunately also misused! Especially the “Level A” is taken as a guarantee of an “optimal” protection.

## THE DEFINITION OF THE “LEVEL A” CODE:

“Level A protection is required when the greatest potential for exposure to hazards exists, and when the greatest



*Pic courtesy of Trelleborg*





Pic courtesy of Trelleborg

level of skin, respiratory, and eye protection is required. Examples of Level A clothing and equipment include positive-pressure, full face-piece self contained breathing apparatus (SCBA) or positive pressure supplied air respirator with escape SCBA, totally encapsulated chemical- and vapour-protective suit,

inner and outer chemical-resistant gloves and boots.”

Will such a “Level A” suit always get the job done? The answer must be no! This even if the “Level A” type of CPS i.e. totally encapsulated type of suits from the theory and some times also from standards point of view are “defined/classified” as offering the “best” protection.

There are many applications where a “Level A” (totally encapsulated) CPS might even jeopardise the safety of the operator. Example of such an application is confined space entries. Other disadvantages of a “Level A” suit are risk for claustrophobia, high breathing air consumption and limited visibility.

Is there an alternative to the “Level A” suit? Yes, there is! It is an advanced type of the “Level B” type of CPS. The main design difference between a “Level A” and a “Level B” CPS is that the SCBA is carried on the outside of a “Level B” suit, preventing the suit from “ballooning”, which a “Level A” suit will always do. A “Level B” CPS is also more snugly cut/ designed to minimise the balloon effect. Due to this, a “Level B” type of suit is ideal for among others confined space entries and it offers superior visibility compared to a “Level A” suit.

From a liquid- and gas-tightness point of view, an advanced “Level B” CPS offers the same level of PF as a “Level A” suit.

#### THE DEFINITION OF THE “LEVEL B” CODE:

“Level B protection is required under circumstances requiring the highest level of respiratory protection, with lesser level of skin protection. At most abandoned outdoor hazardous waste sites,

ambient atmospheric vapors or gas levels have not approached sufficiently high concentrations to warrant level A protection – Level B protection is often adequate. Examples of Level B protection include positive-pressure, full face-piece self contained breathing apparatus (SCBA) or positive pressure supplied air respirator with escape SCBA, inner and outer chemical-resistant gloves, face shield, hooded chemical resistant clothing, coveralls, and outer chemical-resistant boots.”

The impacts of the “Level A, B, C and D” codes vary from region to region. For example in Scandinavia the code is not recognised and an advanced “Level B” type of suit, i.e. with the SCBA on outside, is the predominant type of CPS in use. It is considered as offering the optimal protection also for application within the fire and rescue services, defence agencies and industry. In America the code is in daily use. There might be a difference of opinion between Europe and America when it comes to the “CPS code”; however hazardous chemicals are equally hazardous in Europe as in America.

The complexity of the different standards and types of applications requires a profound and comprehensive evaluation process before a decision is made on the selection of your next generation of chemical protective clothing. Even the word clothing in this concept is perhaps slightly inadequate. Your decision will not be about a piece of clothing. It will be about a life support system – the last link in your chain of personal protective equipment. And someone’s life could depend on it.

Then – what conclusion can we draw from this? It can only be this. That each and every one of us has to take the responsibility for the consequences of our own actions and always keep the work task/application in mind!



John F. Eklund (b. 1951) is Senior Sales and Product Manager of the Trelleborg Protective Products AB, a company within the Swedish international industrial group Trelleborg AB.

John is a highly qualified engineer with more than 22 years of experience in managing the development, engineering, production, marketing and sales of advanced chemical protective clothing (CPC) and other personal protective equipment (PPE).



Pic courtesy of Trelleborg



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# ALBERT ZIEGLER GMBH & Co. KG

## Review on Interschutz 2005, June 6-11, Hannover/Germany

1214 COMPANIES FROM 46 countries all over the world have taken the chance to promote their products during "Interschutz 2005" which took place in Hannover from June 06 to June 11.

The leading fair for fire fighting and security takes place every five years and is the most important platform for the industry and their customers.

Being market leader in Germany for fire trucks from 7,5 tons upwards, ALBERT ZIEGLER GmbH & Co. KG from Giengen/Brenz, Germany displayed their range of products in Pavillon 32 on 1,300 square meters plus 1,300 square meters outside this pavillon.

35 fire trucks of different sizes for nearly all possible applications could be seen and investigated in detail by the visitors, small size vehicles for villages were shown as well as communal fire trucks, fire appliances for professional fire departments and for industrial fire fighters.

One of the five airport fire fighting vehicles presently under construction for Zurich Airport /Switzerland of Type Z 8 was one of the attractions on the Ziegler stand. 25 units of this model are presently in the order books and prove the wide acceptance of this highly sophisticated product.

Regarding the introduction of Category 10 airports together with the NLAs, Ziegler have successfully adapted their Z8 types, including features like pump performance of 10,000 l/min at 10 bar, monitors with the same capacity and a throw of 90 m or more

for water and foam. CAN-BUS technology had been introduced a few years ago and larger coloured TFT-displays at all operating posts make the work easier for the firemen.

In cooperation with Crash Rescue the technology of telescoping booms has been further developed to guarantee a wider range of application.

Together with their subsidiaries in the Netherlands (Ziegler Brandweerteknik), in Spain (Ziegler España) and Croatia (Ziegler d.o.o.) and with their close partners in Switzerland (Vogt AG) and Austria (Seiwald) Ziegler demonstrated their international competence, be it for communal, industrial or forest fire fighting.

Latest innovations such as a new compressed air foam system (CAFS) which allows the individual control of each outlet, even using class A foam and class B foam simultaneously on one truck arouse a lot of interest as well as the CAN-Bus control of all functions on the trucks.

The well proven and patented Ziegler Aluminium Panelling System (ALPAS) for the superstructure has been further developed to make it applicable for smaller fire trucks as well. The ALPAS Compact series was one of the novelties shown on Interschutz.

An optimized roller shutter system prevents dirt and water getting into the inside of the superstructure and a lot of small innovations add to the safety of the fire men and help them to concentrate on their job without much strain on the operation of their equipment.

Special attention was given to Ziegler components like fire pumps, fixtures and monitors which are sold to partner body builders worldwide.

One of the attractions was a semi-built fire truck on which everybody could see the high standard of Ziegler components and Ziegler's diligent way of building, resulting in top quality, unmatched by any competitor.

In the portable pump section Ziegler introduced a new high performance pump with a maximum performance of 1,800 l at 8 bar (1,500 l at 10 bar) at a total operational weight of 108 kgs only.

Innovative hose care systems like the modular hose washing, testing and drying unit or a largely automatized high pressure hose washing machine were displayed and demonstrated as well as a wide range of equipment.

Highlight in this section was the new Cooline® material which enables better temperature conditions for fire fighters in extreme conditions by wearing a special vest, helping to control the body temperature and thus to maximize concentration and performance.

A new rescue cushion for a jumping height of 40 m with the chance to go inside and see the design in detail impressed many visitors.

New on the Ziegler stand were the ambulance vehicles of Ziegler' Dutch subsidiary Visser Ambulance, showing the first version of an ambulance on DaimlerChrysler's E-class with high rise superstructure and air suspension for careful transport. The GRP superstructure and the diligent outfit of the interior do not only allow high comfort for the first responders but also quick cleaning and disinfection for a fast turn-around in operation.

Although the domestic market in Germany has been decreasing during the past three years, Ziegler are rather optimistic as they could maintain and slightly increase their position as market leader in Germany and were successful in international projects.

Around 130 staff assisted the visitors – the majority of the estimated total of around 180,000 people – have been on the Ziegler stand during the six days of this important exhibition with an increasing international public which underlines the function of "Interschutz" as the leading fair for fire services worldwide.

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# Very Large Aircraft Transport (VLTA) Airbus A380

By Joseph A. Wright, Sr.  
ARFF Technical Services, Inc.  
Red Lion, Pennsylvania



Second Level Airstairs Vehicle

## Fire Protection Needs for Post-Crash Conditions

THE PRINCIPAL OBJECTIVE OF a rescue and firefighting service is to save lives. The equipment chosen, the number and selection of personnel, and the training received need to be geared towards this goal. This objective may include requirements for direct interior firefighting intervention. For this reason, the preparation for dealing with an aircraft accident or incident occurring at, or in the immediate vicinity of, an airport is of primary importance because it is within this location that the greatest opportunity to save lives exists.

The possibility of, and need for, extinguishing a fire that can occur either immediately following an aircraft accident or incident, or at any time during rescue operations, must be assumed at all times. The first rule of airport fire fighting is to protect the passenger evacuation areas. Agents selected must exhibit good fire knock-down and extended burn-back resistance for this reason. The most important factors bearing on effective rescue in a survivable aircraft accident are the training received, the effectiveness of the equipment, and the speed with which personnel and equipment designated for rescue and firefighting purposes can be put to use.

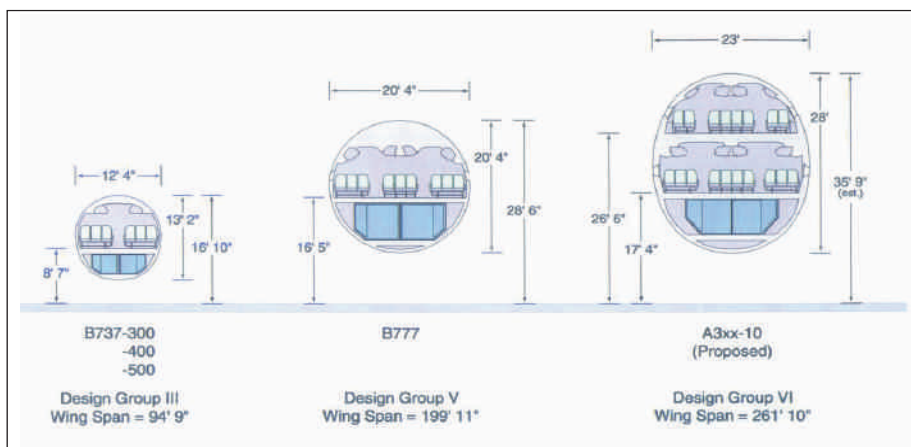
Any airport rescue and firefighting

service should be equipped, trained and prepared to handle the largest aircraft anticipated to come into the airport.

This training and equipment should all meet international consensus standards such as National Fire Protection Association (NFPA) and International Civil Aviation Organization (ICAO) Standards and Practices. In the United States these airports would also have to meet the index requirements of the Federal Aviation Administration's (FAA) Federal Air Regulation (FAR) Part 139. This will require the construction of a state-of-the-art training facility that will

*The first rule of airport fire fighting is to protect the passenger evacuation areas. Agents selected must exhibit good fire knockdown and extended burn-back resistance for this reason.*





*The new designs will be taller than existing designs*

emulate these large aircraft. Airports that are projected to receive services of the next generation Very Large Transport Aircraft (VLTA) like the new Airbus Industries A380 need their fire fighters to receive training at facilities of the size and scope of this new aircraft. This aircraft will have the potential of carrying 600 to 1000 passengers traveling on three levels of occupancy, and should there be an accident, it will be of the highest magnitude and will test the tactics and strategies of the any Airport Emergency Plan.

Airports located at Los Angeles (California), Seattle (Washington), Orlando (Florida), Singapore (Japan), Bangkok (Thailand), Paris (France), London (England), Sidney (Australia), and New York (New York) will potentially be just a few of the cities which airlines will want to utilize the capabilities of the Airbus A380 to provide long range flight service. There will be many other locations throughout the world where the advantages of long range, plush interior accommodations, and large passenger capacities will dictate the

A380 as the aircraft of choice.

This new aircraft will be very complex, and will have many areas in which disorientated passengers may become trapped due to the aircraft being filled with smoke. Should a post-crash fire develop, the flow of escaping passengers may take quite a bit more time than the proposed 90 seconds evacuation time. Some variations of the aircraft may include sleeping quarters on the lower deck for Business and First Class travelers. The above illustration depicts the size and growth from narrow body aircraft to the new Airbus A380 series of aircraft. When viewing the cutaway drawing of the Airbus A380 aircraft, it can be seen that should an accident occur with some impact to the airframe, many of the compartments of the aircraft could be damaged and require a detailed confined space search and rescue approach to passenger extrication.

Currently there is no requirement to have airport fire fighters trained in confined space rescue procedures. In the United States there is not a single training facility that provides for second level aircraft fire fighting or rescue

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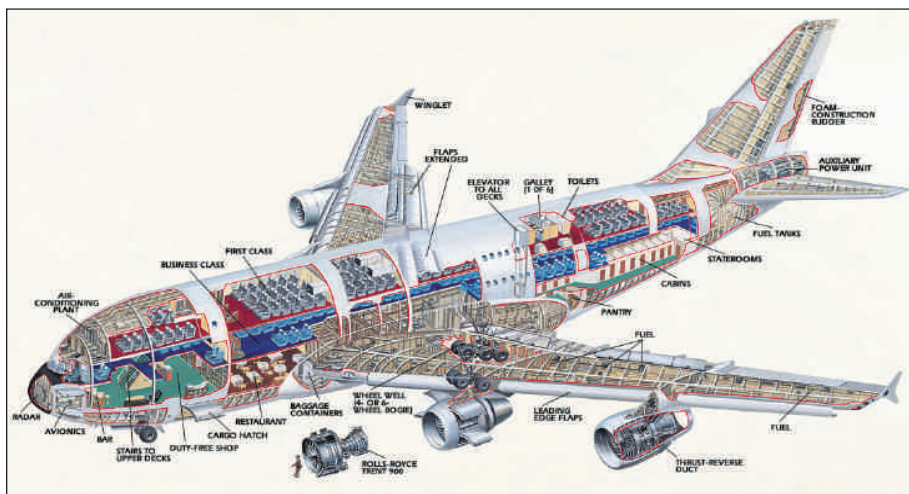


operations at this time. Fire fighters need to train using the tools and equipment necessary while replicating second level responses.

The Airbus A380 has a high percentage of new composite materials. These materials will bring with them new dangers and problems for fire fighter protection. New strategies and tactics for fire fighting, medical evacuation, post-crash clean-up, and accident investigation will require a higher degree of protection and concern from the related dust and debris. High energy cold foam can be used to temporarily seal the dust and provide a degree of protection while passengers are removed and other emergency services are provided. The thick foam when applied can be built up on the surfaces of debris to prevent the movement of fine particulate dust into the air.

Emerging technologies should be integrated into the Aircraft Rescue and Fire Fighting (ARFF) services rescue and firefighting strategies, as well. Among these technologies are elevated extendable booms equipped with systems that can pierce the skin of the aircraft cabin to deliver agent to the various levels of the burning interior early enough to increase passenger survivability rates. These elevated extendable boom devices can also deliver agent low to the ground, or they can be extended for high-reach applications. Firefighting attack teams, which currently lack the specialized equipment necessary for the Airbus A380, will have to work off of handheld ladders, climbing as high as 27 feet (9 meters) above the ground to reach the aircraft. Not only is this difficult, time-consuming, and dangerous, but it has not proved to be effective.

Ten emergency slides will extend out from each side of the Airbus A380 aircraft approximately 30 to 40 feet. Passengers will be coming down from both of the major occupied levels of the aircraft simultaneously, thus it will be difficult for fire fighters to gain early entry into the cabin or position necessary passenger egress equipment such as rolling stairways near the door openings to make a timely interior entry. High winds could easily lift slides from the ground making them unusable. A lot of manpower will be needed to assist evacuating passengers at the



Cutaway drawing of the Airbus A380 courtesy of Airbus Industries, France

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bottom of the slide areas. Early suppression of interior fires can be accomplished if the proper equipment is available. Thus it is important to have the ability to pierce the aircraft with an extendable elevated boom fitted with a piercing device which will allow the early intervention of fine mist water spray into the cabin areas should the need arise.

A new device such as this to service the firefighting needs of the Airbus A380 has recently been developed. The height of the Airbus A380 required the reworking of the current design to allow the reach to be extended to 65 feet. The new design can be positioned at the open second level doorway of the A380 aircraft or can pierce above the window levels on the second level of the aircraft.

With both upper and lower evacuation slides coming off the aircraft from both sides of the aircraft, it was important to be able to have substantial

vehicle standoff from the vehicle's position and side of the aircraft. The new design of extendable boom has the greatest standoff distance of any elevated boom manufactured far for this airport rescue purpose. A 34-foot reach from the front of the vehicle's bumper to the side of the aircraft should allow positioning in close quarters to the evacuation slides and allow the elevated boom to reach up, out, and over slides without interfering with the emergency operation of the slides. This was an important factor in the consideration to develop the new elevated extendable boom system.

Technical advancements have improved operation of the extendable booms. These improvements include three extendable boom arms to provide increased reach and upgraded computer



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controls to reduce extension times and provide operators with ease of operation and positive feedback. The new extendible booms provide for two high-capacity monitors which can be individually controlled at the midpoint boom position and at the high elevation position of the fully extended arm. In addition, the piercing nozzle device is now hydraulically assisted to aid in piercing the heavy skin of the Airbus A380 or other similar aircraft. The new design can also be fitted with an optional manifold system to allow hand lines to be run from the area of the piercing nozzle. This will greatly reduce the problem of getting hand lines into the interior second level should there be a need for this strategy.

Improvements in thermal imaging, multiple agent capability, and vehicle designs are keeping pace with the new challenges of VLTA deployment. However, all of this technology also requires proper training. Computerized simulators are now available to aid in this training. This is a unique device which allows the vehicle operators to train and hone their operator skills at several levels of proficiency without leaving the fire station. The computer simulator trainer will come includes a computer with preloaded software and console controls which match the specific truck installation. The simulator can be delivered up to 90 days before the actual truck arrives at the fire station. This allows firefighter to have the advantage of learning the controls and operation of these specialized components before the real systems arrives.

*Improvements in thermal imaging, multiple agent capability, and vehicle designs are keeping pace with the new challenges of VLTA deployment.*



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This reduces vehicle use for training purpose and lowers maintenance cost by having proficient operators.

Due to the large number of evacuation slides and potential passengers to be evacuated from the Airbus A380 aircraft, specialized evacuation-assist vehicles will be needed to replace slides that fail due to fire exposure. Fire fighters will need mobile stairways with off-road capability to assist in evacuation and to serve as platforms from

which tools can be provided to perform positive ventilation procedures to remove toxic smoke from the aircraft. Fire personnel must be able to drive these mobile stairways safely off-road, yet the stairways must be able to reach more than 27 feet (9 meters) into the air.

In conclusion, the Airbus A380 presents certain challenges to the ARFF community due to its size and the large passenger capacity. Specialized training

facilities which match the size and scope of the aircraft will need to be built. Special advanced composite materials will require unique fire protection strategies and tactics. New rescue vehicles that can provide both an escape route for fleeing passengers and a work platform for fire-fighting equipment will be needed. Early suppression of interior fires will require higher reach extendable booms with piercing nozzle capability which can work over and away from emergency slides and evacuating passengers. Finally, there will be a great need for additional manpower to assist passengers and hold slides at ground level under high wind conditions.

Joseph Wright was the Program Manager for Aircraft Rescue and Fire Fighting Research for the Federal Aviation Administration and retired after 34 years in the year 2000, from the FAA's William J. Hughes Technical Research Center located at the Atlantic City International Airport, Atlantic City, New Jersey.

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# Respiratory prot

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**Tony Pickett**  
 Product Manager – Air Supplied  
 Scott Health & Safety

piece and provides the user with clean air to breathe via a filter or air supplied unit. The closed-circuit system does not release the exhaled air, but recirculates it through the apparatus and removes CO<sub>2</sub> from the exhaled air. Oxygen is then added back into the circuit so the recycled air can be re-breathed. Open-circuit RPE are of either 'filter' or 'compressed air breathing apparatus' (CABA) types or 'fresh air breathing apparatus' (FABA) varieties. CABA are what fire fighters use for most common applications.

Non-self contained RPE consist of an external air source, i.e., fresh air hose, or compressed air being supplied from cylinder(s), airline trolley or a compressor. Most fire fighters would previously not have considered this type of product as suitable for traditional applications. They are however ideal for the newest scenarios of urban search and rescue, confined space entry, prolonged decontamination, ladder platform operations, and generally where conventional SCBA are not appropriate due to either size, duration or condition restrictions.

## AIR PURIFYING RESPIRATORS

Air purifying, as the name suggests is a method of taking the ambient air and purifying it so that it can be used for respiration, it relies on a filtering mechanism. These filters are used in personal protection equipment (PPE) defined as negative pressure and powered air purifying respirators (PAPR).

SINCE THE ADVENT OF respiratory protection in the 1870s, when fire fighters utilised a simple respirator and filter, today's equipment has come to use high performance technology in demand valves, pressure reducers, face pieces and integrated electronics. The use of Self Contained Breathing Apparatus (SCBA) is considered to be a basic tool for structural fire fighting, however there are other types of Respiratory Protective Equipment (RPE) that can be very relevant in today's modern fire services and the challenges that they now face.

Since fire services were first formed to protect small communities and developing towns and then cities, the situations and types of hazards that they face have changed as well. As people have moved into larger urban communities and are living more densely, buildings have increased in both size and height. Populations have grown with more people now living in rural areas where previously natural fires could burn without needing to be checked. These fires now need to be fought to protect human life and property. In recent years the threat of terrorism has led to solutions where respiratory protection may be required for a prolonged period without the hazards of fire or oxygen deficiency. There is also an increased need for

urban search and rescue operations.

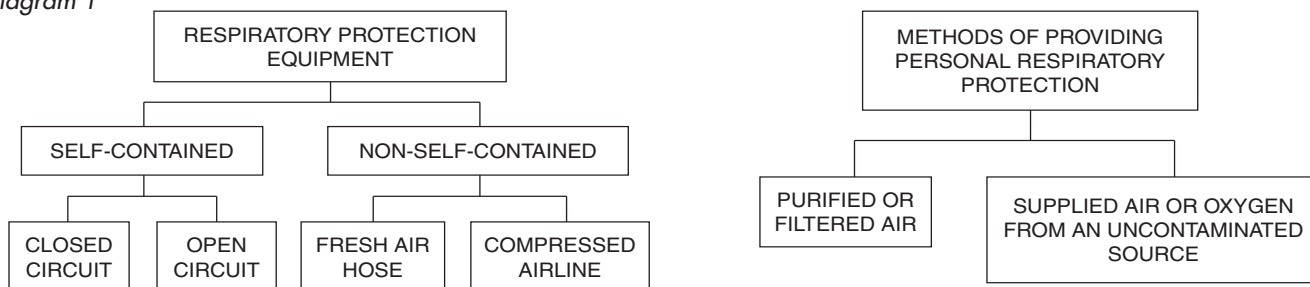
At this point an explanation of the types of RPE available would assist fire fighters in making the correct choice for the situation at hand. So let's start at the beginning.

RPE comprise two main types: 'air supplied' and 'air purifying', both can be 'self contained' and 'non-self contained', as shown in diagram 1.

Air-supplied RPE supply the user with air from a source independent of the ambient atmosphere. Below is a brief description of the types detailed in the diagrams.

Self-contained RPE are made up of either 'open-circuit' or 'closed-circuit' types. An open circuit apparatus releases all exhaled air into the atmosphere through an exhale valve in the face

Diagram 1



# ection explained

Filter technology is becoming more advanced but does have limitations, most notably, filters should not be used in atmospheres that are suspected or could be Immediately Dangerous to Life or Health (IDLH), oxygen deficient, where the ambient or contaminant conditions are unknown, or in confined spaces such as sewers and tanks. There are however, many benefits like task specific head piece designs that are lightweight, durable, lower cost, compact, or require less maintenance. Therefore, it is worth recounting the types of filters.

Particle filters are approved to P1, P2 or P3 categories, being a measure of the efficiency of the filter media, also with reference to the relative limited capability of the mask.

By definition P1 and P2 filter classifications account for the level efficiency associated with the face piece style and filter media. For example, P1 and P2 are the highest ratings a half mask can be given. P1 (solid particles of inert substances) relates to 80% efficiency, while P2 (solid and liquid particles of low toxic substances) relates to 94% efficiency.

A P3 classification can only be achieved with full-face negative pressure face pieces and PAPR units, and relates to 99.95% filtration success of solid and liquid particles of a toxic and highly toxic substances, for example: smoke, off-gassing in wildfires, radioactive and toxic particles, as well as micro-organisms such as bacteria, viruses, and enzymes.

Gas filters are manufactured from activated carbon. The efficiency of a gas filter is dependant upon the filtering surface, carbon volume, granule size and pores in the carbon, the physical adsorption and the chemical absorption. Specific filter are designed for particular gases, eg organic, inorganic, acids and ammonia.

The gas life of a filter is often difficult to determine. Factors such as humidity, temperature, breathing rate and gas concentration will all affect filter life. Caution should be used in trying to calculate filter life as very often halving the concentration will less than double the gas life. The filter should be replaced BEFORE the filter life is exhausted to prevent any contaminant exposure to the wearer.



*Pic courtesy of Scott Health & Safety*

## POWERED RESPIRATORS

PAPR units essentially pull air through the filter media and deliver the purified air into the user's mask or head covering, at typically 120-200 litres per minute. Due to the benefits of positive flow rates and lower breathing resistance, the availability of task designed head-tops (forensic, laboratory, infectious disease and many more) and compatibility with special apparel, the future will see more PAPR units used in certain response scenarios, such as CBRN and spill containment.

These types of equipment however, can be suitable for decontamination procedures and for fire fighters who are working in the warm and cool zones of an area that have been subjected to a

'Chemical Biological Radioactive Nuclear' (CBRN) attack. They could also be ideal for situations such as wildfires. Work-studies are ongoing to determine what gases are present during the burn and the effectiveness of various types of RPE.

## SCBA

When first used in the 1920s, CABA duration was approximately 20 minutes. Since this time, major advances have taken place. Cylinder technology has developed from heavy steel to alloy steel, aluminium, glass-hoop wrapped aluminium and glass full-wrapped cylinders, to the current technology of fully wrapped carbon fibre cylinders with steel, alloy or plastic liners. In most cases, the maximum filling pressure is



*Pic courtesy of Scott Health & Safety*





*Pic courtesy of Scott Health & Safety*

either 200 or 300 bar. As well as cylinder advances, Compressed Air Breathing Apparatus (CABA) have moved from negative pressure to positive pressure via a manual switching mechanism, to the current first breath activated positive pressure systems.

Harnesses have also changed to be much more flame resistant, being manufactured from Kevlar material. When designing an apparatus there is now also more emphasis on materials that will be resistant to the substances used

in a CBRN attack.

Mask design has also improved with the utilisation of superior materials, enhanced visor profiles to increase vision, greatly improved speech diaphragms, and voice amplifiers and communications devices that can be integrated onto and into the mask. When speech enhancements such as amplifiers or communication devices are utilised consideration should be given to flame retardancy and intrinsic safety. Many of the devices currently available

offer apparent speech enhancement without any consideration to the flame testing requirements of the mask and the environment it is used in, hence, loss of communication can occur in severe environments.

The introduction of 'Integrated Electronics and Information Systems' includes integrated 'automatic distress signal units' (ADSU), otherwise known as 'personal alert safety system' (PASS) devices; digital pressure gauges; temperature sensors (important as the latest personal protective equipment (PPE) protects the fire fighter from the outside environment to such an extent that he does not know the heat he is actually in); automatic breathing duration calculations (time to whistle); and specified alarm points. These features are stand-alone on the SCBA.

Recently a major advance has been the ability to transfer the data via telemetry to a base station. The base station provides the officer in charge or breathing apparatus (BA) controller critical information enabling him to make informed decisions on the fire ground or at an incident command post.

One of the major challenges for manufacturers is finding suitable battery technology that performs in the fire fighter's environment, while maintaining complete functionality. In order to

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*Pic courtesy of Scott Health & Safety*

maintain the intrinsic safety requirements, specific battery brands and models might be recommended. If not the intrinsic safety approval may be reduced or not apparent. Even though electronic interfaces provide desired data, the essential function of the SCBA must not be compromised. For example, should a battery be discharged for whatever reason, the SCBA must still be able to function utilising its standard pneumatic systems, including analogue pressure gauges and low air warning devices. When selecting telemetry equipment consideration should be given to the availability of a suitable approved frequency with the relevant local authorities

The future of telemetry information systems, team coordination, controlling crews, communication, 3D mapping, and crews moving through an incident are all ultimately guided by their true cost and how these funds are made available from treasury. The challenge for fire fighters is to present the strongest possible case in order to access the latest in life saving technology.

## CONCLUSION

Ultimately fire fighters of today have never been better protected against the external environment in terms of respiratory protection. Despite this, the introduction of new technology, including telemetry systems on SCBA, can sometimes confuse or be daunting to purchasers within fire brigades.

The primary purpose of breathing apparatus and other types of respiratory protective equipment used in the fire service is clear – “to offer respiratory protection to the user and allow access to non-respirable or contaminated atmospheres for rescue and fire fighting procedures”.

It is important to remember that this

is the primary function of the RPE, as over the years these types of equipment have had new technologies introduced to them that appear to add many extra features, some of which may or may not be relevant to all. Whilst it is not suggested for a minute that fire brigades shouldn't utilise the latest technology to the fullest, they should also not forget the primary function of SCBA and other RPE or neglect back up mechanisms such as analogue gauges and pneumatic warning devices.

At the same time they should not lose sight of what technology can do to enhance the SCBA or of the benefits that it can bring.

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# Hazards with Liquefied

WHEN CRUDE OIL IS REFINED, the first material to come over is gas which was previously dissolved in the crude. This is usually principally propane, there being small proportions of other ingredients including butane. A gas can be converted to a liquid by application of pressure only if it is below its critical temperature.

The critical temperature of propane is 97°C, therefore the gas can be converted to liquid at room temperature by application of pressure. When the gas from crude oil is so treated the product is called LPG. Sometimes gas of equivalent composition is obtained at the oil well instead of at the beginning of refining in which case the end product is still LPG. This must not however be confused with 'associated gas' which is the term reserved for natural gas, predominantly methane, when it occurs with crude oil.

Whether obtained at the well or at the refinery, the gas comprising predominantly propane is put under pressure until a liquid surface starts to appear, whereupon there is liquid-vapour equilibrium. At temperatures up to about 40°C the pressure at which liquid starts to appear is up to 14.5 bar. This then is the pressure which a vessel subsequently containing LPG in two-phase form has to withstand, and this is not a difficulty. A pressure of 14.5 bar corresponds to 1.45 MPa and steels have design stresses at ordinary temperatures of over 100 MPa. Having regard to vessel dimension and whether or not there is a weld it is straightforward for a chemical engineer to estimate what wall thickness of vessel will be required. As an example, if LPG is stored in a carbon steel spherical container of 5 m diameter without a welded seam a wall thickness of 13 to 15 mm is required.

## THE CURRENT WORLD MARKET FOR LPG

The top ten producers of LPG, in descending order, are the US, Saudi Arabia, China, Canada, Algeria, India, Mexico, Russia, the UK and Abu Dhabi. Their combined production in 2004 was 131 million tonne. LPG has many applications including of course vehicular use.

## A BLEVE PROPERLY UNDERSTOOD

The term BLEVE – boiling liquid expanding vapour explosion – often seems to be associated primarily with LPG. This is unfortunate, as a BLEVE is

in fact purely a physical phenomenon requiring no chemical heat release by combustion. If a vessel containing vapour and liquid in equilibrium at a highly superatmospheric pressure, perhaps steam-water, fails so that the contents can escape the mechanical energy due to rapid evaporation breaks up the vessel and pieces of material are scattered with sufficient speed to be fatal if they impact upon a human being.

The above paragraph has emphasised that non-flammable liquids BLEVE, and there has been such behaviour with hot water systems. A fatal BLEVE also occurred in the US about 20 years ago when a young man having consumed most of the contents of a bottle of beer he had bought screwed the top back on and threw it into a bonfire. The fluid remaining in the form of the beer which

By Dr Clifford Jones

source of ignition of the vapour: the emphasis is on can, as ignition is not certain to occur when LPG leaks catastrophically. If ignition does not occur it there has been a BLEVE but not a 'BLEVE-fireball'.

## LPG COMBUSTION BEHAVIOUR WHEN ACCIDENTALLY LEAKED

In the previous section we were concerned with catastrophic leaks and ignition the result of which is a fireball or, better, a BLEVE-fireball. This is very powerful combustion indeed, with peak temperatures of 1500K or higher. The duration will be up to about 20 s, depending on the amount of LPG leaked, and the maximum heat flux typically 300 kW m<sup>-2</sup>. It is an entirely reasonable approximation for many engineering purposes to treat a hydrocarbon flame as a black body. In the boxed area below the figures given above for temperature and radiative flux are reconciled on this basis:

For a black body the Stefan-Boltzmann Law applies:

$$q = \sigma T^4$$

where  $q$  = radiative flux (W m<sup>-2</sup>),  $T$  = temperature (K) and  $\sigma$  = Stefan-Boltzmann constant =  $5.7 \times 10^{-8}$  W m<sup>-2</sup>K<sup>-4</sup>

Putting  $T = 1500$  K gives  $q = 289$  kW m<sup>-2</sup>

had not been consumed was sufficient to cause a BLEVE and the young man was killed by the flying fragments.

A container of LPG being a liquid-vapour equilibrium at very high pressure can of course BLEVE in the same way that water-steam can, but with LPG there is the additional factor that the material released is flammable and, on mixing with air having exited the vessel, can ignite. When this happens there are two phenomena in succession: the BLEVE, and ignition resulting in a fireball. Hence the term BLEVE-fireball is perhaps the best way to describe such an event. The rapidly moving liquid layers in a BLEVE rip off electrons in the same way that rubbing a piece of ebonite with cloth does in the elementary physics experiments we all did at school. The electrostatic effects so resulting with LPG leaks can provide a

Two further points will be made before we pass on to other forms of combustion behaviour with leaked LPG. First, as a fireball takes its course the size, the temperature and the heat release rate each increase to a maximum and then decline, eventually back to zero for the size and heat release rate and to ambient for the temperature. It is not certain that the maximum in size and the maximum in temperature coincide. Secondly, from photographs of LPG fireballs it appears that a cylinder might sometimes be a better approximation than a sphere for the shape.

If in a container of LPG a hole is accidentally created, for example if a tankcar containing LPG is derailed and a hole in the wall of the tankcar results from the impact, the LPG will exit rapidly through the hole and this might be sufficient to prevent a BLEVE by relieving

# and Petroleum Gas (LPG)

the pressure. If under these circumstances there is ignition the result will be a jet fire. This too is very powerfully heat releasing and potentially fatal to persons. The worst ever LPG accident was in Illinois about 35 years ago when a train pulling several tankcars of LPG along with many other types of freight car derailed. It happened then that a jet fire from an LPG-bearing tankcar in which a hole had been made torched another LPG-bearing tankcar which had not in fact been damaged by the derailment, causing it eventually to explode.

Mention has been made that LPG leaked either catastrophically or more slowly through an accidentally created orifice will not necessarily ignite. The danger does not however stop there. Once the leaked material has entirely evaporated the hazard is not that of LPG but that of propane gas. A cloud of this, if at a concentration above its lower flammability limit, can of course ignite if there is an ignition source. Such ignition will result in one of two phenomena: a vapour cloud explosion or a flash fire. In the former there will be an overpressure but not in the latter. The overpressure resulting from a vapour cloud explosion can be fatal to persons or can cause non-fatal injuries in particular to the skull and/or the lungs. The heat can also be fatal and in a flash fire, where there is no overpressure, the heat alone can be lethal.

Given that the propane gas is present at a concentration above its lower flammability limit there is no precise way of predicting whether, on ignition, a vapour cloud explosion or a flash fire will result. However, the presence of obstacles such as buildings and plant which will increase the turbulence of the propane-air mixture will tend to promote vapour cloud explosion behaviour

to the exclusion of flash fire behaviour. What is hoped for in such situations is that the cloud will drift sufficiently for the propane to be diluted below its lower flammability limit in which case, of course, it cannot ignite. There are simple correlations for predicting the drift distance required for such dilution for various wind speeds. Propane, being significantly more dense than air, will disperse as a 'dense gas' in contrast to (for example) ethane which has about the same density as air and will therefore disperse 'passively'.

## COMPARISONS OF LPG AND LIQUEFIED NATURAL GAS (LNG)

The critical temperature of methane is 191K, so it cannot be made into a liquefied gas at ordinary temperatures as propane can. Before it can be made into a liquid it has to be taken to a temperature below 191K, possibly by passing it rapidly through a nozzle so that a major part of its heat content is converted to kinetic energy. Once the methane is so cooled it is contacted with successively colder refrigerants until, at 112K, it becomes liquid. It is not a liquefied gas in the sense that LPG is: it is simply a cryogenic liquid in equilibrium with its vapour at atmospheric pressure. LNG is a major fuel on the world energy scene, the largest exporter of it being Indonesia and the largest importer Japan.

Fireball behaviour has been observed with LNG when catastrophically leaked. If leaked on to a surface it can burn as a pool fire. It has been a point of some discussion whether LNG displays BLEVE behaviour but the view of this author is that it does not. It is stored and transported as a quiescent liquid in equilibrium, or at least in contact, with its

vapour at atmospheric pressure so it is difficult to see how the mechanical forces due to rapid phase change which cause BLEVE behaviour with LPG could occur with LNG.

## Concluding remarks

The idea of this article has been to extend my previous one on liquid fires with special reference to LPG. A clarification of the term BLEVE has been given and combustion behaviour of leaked LPG discussed in moderate detail. Some comparisons with LNG have been made and the continuing question as to whether it can BLEVE addressed but almost certainly not settled!



Dr Clifford Jones, currently a Senior Lecturer in the Department of Engineering at the University of Aberdeen and a Reader from October 2005, has published five books (with a sixth in press) and more than 230 articles on different aspects of combustion during an academic career spanning 27 years.

Dr Jones began his career in Sydney, Australia, and moved to Scotland in 1995. While living in Australia, he gained a reputation for his research into how bush and forest fires start and spread. Since working in Aberdeen he has focused on fire safety at offshore gas and oil rigs. In recent years he has also acted as consultant to a number of major chemical producers.

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*Given that the propane gas is present at a concentration above its lower flammability limit there is no precise way of predicting whether, on ignition, a vapour cloud explosion or a flash fire will result.*





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# Fire and Rescue Training





# CFA Training Col



## FACILITIES

CFA has invested heavily in providing Fiskville with the infrastructure necessary for it to perform its role as a world-class training centre. Facilities include a 115-seat auditorium with full cinema capabilities, hotel-style accommodation for 80 students/personnel, classrooms with audio-visual equipment, a “theatre-in-the-round” facility for conducting Tactical Exercise Without Troops (TEWT) training, a full reference and lending library, operational airfield, heli-pad, and more.

## TRAINING PROGRAMS AND COURSES

Today, Fiskville is the largest of CFA’s seven field training campuses, providing over 100 different types of courses each year, to approximately 8000 clients and students. Instructional staff members are selected on merit, and are a mixture of permanent positions and fixed-term secondments, with appointment to Fiskville being seen as a privilege and a pathway to future career development.

Formed in 1944, the Country Fire Authority (CFA) is the largest of three fire services charged with providing fire suppression services within the State of Victoria, Australia. CFA is responsible for protecting a population of over 2.5 million people, and is responsible for an area of 150,182 square kilometres. With 1214 brigades, a fleet of over 2000 firefighting appliances and a workforce of almost 60,000 (including 450 career firefighters and approximately 59,000 volunteers), CFA is one of the largest emergency service organisations in the world.

In 1926, the AWA (Amalgamated Wireless of Australia) company established a long-range radio transmission station on a 180-hectare site approximately 90 kilometres north-west from Melbourne, Australia. The purpose of the facility was to enable overseas wireless communications from Australia to Canada and England. This station, named “Fiskville” after Sir Ernest Fisk, the-then Chairman of AWA, was the location of the first wireless transmission from Australia to England. During the Second World War, Fiskville was operated by the Department of Defence as a communications station. Post-war, OTC managed the site, until the advent of modern communications equipment (such as satellites) rendered Fiskville’s long-range radios obsolete. In 1972, Victoria’s Country Fire Authority (CFA) obtained the facility, and set about transforming it into its flagship training facility.





# College – Fiskville

The sheer number of courses conducted at Fiskville is immense, ranging from practical firefighting skills acquisition and maintenance courses, to administration, management, and technology symposiums. Training encompasses not only CFA volunteers and career staff, but also personnel from other emergency service organisations within Australia, and also from overseas. Private industry is also well represented, with training provided to private fire service personnel from areas as diverse as the petrochemical industry to the prison system.

## RECRUIT TRAINING

The Recruit Firefighter Course is an intensive 16-week syllabus, which aims to teach recruits the skills necessary to perform as career firefighters. The course encompasses both classroom and practical firefighting training, and upon graduation, the students are posted to an operational fire station as CFA Level 1 Firefighters. Recruit courses for career firefighters are normally held a couple of times each year.

## CAREER AND VOLUNTEER

A large number of courses are available to both career and volunteer members for skills acquisition and skills maintenance. These range from basic firefighting techniques (i.e., for volunteer members new to the service), specialist courses such as Urban Search and Rescue (USAR) and Aircraft Fire Attack, up to advanced courses such as Incident Management and the Diploma of Business.

## INDUSTRY

Private industry training is one of Fiskville's core businesses, with upwards of 2000 students a year passing through its doors. These come from many different areas, with private fire services from the steel and petrochemical industries being amongst the most common. Training is provided in basic



and advanced firefighting techniques, incident leadership, Hazmat, and specific technical skills pertinent to the industry at hand.

## EMERGENCY SERVICE ORGANISATIONS

A number of other Emergency Service Organisations (ESOs) from within Australia and overseas utilise Fiskville's facilities. Whilst exterior fire services,

such as Melbourne's Metropolitan Fire and Emergency Services Board (MFESB) concentrate mainly on practical firefighting, other agencies such as Victoria Police and the Department of Sustainability and Environment (DSE) incorporate Fiskville into numerous facets of their training. Law enforcement, explosives demonstrations and post-blast analysis (for trainee







detectives) are just some of the many scenarios which are common.

#### INTERNATIONAL

An increasing number of international organisations are utilising Fiskville for training and events. Fiskville recently hosted an international VECTOR Command symposium, with a number of different fire service participants from within Australia, the UK and New Zealand. International observers from China and Norway have also visited recently, whilst CFA provides firefighter training to members from Fiji's National Fire Authority (NFA) on an ongoing basis.

#### PRACTICAL FIRE TRAINING

Practical fire training takes place within a number of different precincts known as PADs (Practical Area Drill). These contain a wide range of props, ranging from flammable liquid and LPG-fuelled installations to aircraft wrecks and off-road driving areas. Safety is of paramount importance, and the props are maintained under a rigorous safety program, whilst accredited PAD staff ensure the safe operation of the props whilst drills are conducted.

#### FLAMMABLE LIQUIDS PAD

This large concrete hard-standing area contains a variety of different props, simulating some of the different types of incidents involving flammable liquids, which firefighters encounter in real-world situations. Dominating this area is the Tank Farm and Cracking Tower, which represents a banded bulk storage/refinery area. Other props



include a drain for running fuel fires, bulk fuel tanker, the "Maltese Cross" (a B Class fire prop), a flammable liquids pit, and a bulk storage vessel mounted on a rail car. All of these props are fuelled using flammable liquids; diesel or petrol, or a combination of the two. Safety of crews is enhanced through the use of 64mm hoselines operating from a secondary water supply.

#### LPG PAD

This area is divided into two parts; the Primary and Industrial PADs. The Primary area contains props designed to simulate the kind of incidents that crews may encounter on a common basis. These include 45 and 90-kilogram gas cylinders, an impingement shield, and a mock service (petrol) station, complete with bowzers and vehicles. Students are taught the various suppression methods appropriate to these scenarios, including isolation of cylinders using fog pattern hose streams from 38mm lines.

The Industrial PAD embraces more advanced scenarios; horizontal and vertical gas bullets and an elevated flange, all designed to simulate an industrial application such as a gasworks.

#### STRUCTURAL FIRE ATTACK PAD

Maintaining realism in structural fire attack training is often a challenge, and the Structural Fire Attack PAD was designed with this in mind. A mixture of single and double-storey buildings

provides realistic structural training environments for this type of firefighting, with the added bonus of being able to be used on a repetitive basis (i.e., they don't burn!).

One of the more impressive props is the LPG-fuelled Flashover Simulator, which represents a typical lounge room fire, replete with (steel) couches and chairs. The fire is controlled throughout the simulation, which culminates in a lean flashover. Students are able to experience this phenomenon from within the room, and thus directly observe the growth stages of the flashover, as well as the radiant heat and flame pattern of the final event.

#### ROAD ACCIDENT RESCUE PAD

As the name implies, this area is dedicated to teaching RAR students the different techniques of patient extrication from vehicles. Students are able to employ various techniques first-hand, thanks to the large number of derelict cars available for training. Whilst most of these do end up a somewhat worse-for-wear, they are available to be used in other Hot Fire Training drills, such as on the Flammable Liquids PAD.

#### URBAN SEARCH AND RESCUE PAD

This prop simulates a collapsed multi-storey structure, and allows students to be trained to INSARAG Category 1 level. Following the tragic events in New York of September 2001, and in the lead up to the Commonwealth Games being held in Melbourne in



2006, government attention has been focused on this field of emergency response. Students progressing to Category 2 standard are trained using facilities available at sister Training Colleges in New South Wales and Queensland.

#### CONFINED SPACE RESCUE PAD

A series of inter-connecting tunnels and voids make up this prop, designed to teach students the intricacies of confined space rescue. Escape hatches and equipment are provided to ensure student safety.

#### CABA PAD

This large three-storey building is used to train students in Compressed Air Breathing Apparatus and Search and Rescue techniques. Part of the building is set up to represent the hold of a ship, complete with hatches, ladders, engine room etc. Other parts of the

building represent a collapsed domestic structure, with framing, debris etc.

#### MISCELLANEOUS

In addition to the various PAD areas, there a number of other props scattered throughout the grounds. The wreck of a piper Chieftain light aircraft is used to teach the skills necessary to combat civil aircraft accidents, whilst an ex-Royal Australian Navy Wessex helicopter is provided for military scenarios.

#### SUMMARY

With a staff of over 70, and access to some of the best training resources available, Fiskville is well placed to continue its role as a world-class training provider for CFA, other Australian ESOs, private industry, and international customers. Last year CFA attended over 60,000 incidents, a number that continues to increase, as both Melbourne and Victoria's populations continue to expand. As the demands for quality training also increases, so too will Fiskville continue to grow to meet these challenges.



For further information,  
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[www.cfa.vic.gov.au/about/fiskville.htm](http://www.cfa.vic.gov.au/about/fiskville.htm)



# Realistic and safe



*Pic courtesy of Draeger Safety*

**THEORY AND DRY TRAINING** do not adequately prepare the emergency responder to be able to meet and effectively deal with the dangerous conditions that occur during fire fighting operations. During training, the trainees must be exposed to live fire under safe and controlled conditions in order to gain the required confidence and skills.

**M**odern systems provide a level of safety that far exceeds concepts previously experienced in fire training. A “state-of-the-art” control system, instructor pendants and a wide range of automatic and manual safety features provide 100% safety and security at all times during training.

The new range of PLC- or computer-controlled, gas fuelled hot fire training systems offer the optimal training platforms for any kind of fire training allowing fire-fighters to effectively achieve all hot-fire training objectives.

Previous live fire training systems used Class A combustible materials or diesel fuel for live fire training. Missing safety features caused many injuries to trainees as these fires were out of control, without any safety features.

Inside a building such fires were ignited within a conventional building, without any special protection for the structure of the building and thus with a high safety risk for the training fire fighters.

In addition, these conventional combustibles caused high pollution to water, air and soil of the training ground. Nowadays, environmental rules and regulations do not allow live fire training facilities to use materials that are likely to pollute the environment.

**Gas fuelled, PLC- and computer-controlled systems** are reliable, realistic and safe solutions for the modern type of live hot fire training systems. These systems replicate safely and realistically any kind of fire, fully controlled for the utmost safety for both trainees and instructors.

**Mr Jakob Spiegel**  
**Consultant, Fire Training**  
**Systems**  
**Chairman, Fire Brigade**  
**Association of**  
**Kaiserslauten, Germany**

These systems are available for:

- Structural Fire Fighting in buildings
- Industrial Fire Fighting
- Military Fire Fighting
- Aircraft Fire Fighting
- Crew Training
- Special Applications like Tunnel Fires, Forest Fires, Offshore platforms etc.

## SAFETY FEATURES

Safety is a key focus when considering live fire training, including fires inside burn buildings, modular systems, and fires inside fully encapsulated rooms, DIN 14097 part 2 is the world leading standard for gas fuelled, live and hot fire training systems:

**Gas Monitoring Systems** are used for each burn room with at least 2 redundantly operating gas sensors or gas sampling systems. Typically 2 alarm settings are configured: At 10% LEL, automatically causing the ventilation system to provide fresh air; At 25% LEL (or in some areas at 35% LEL) all gas and smoke production is stopped immediately and the ventilation system runs on full purge.

In all adjacent rooms to the active burn room or in the technical rooms, at least one gas sensor is also installed to further enhance safety.

**Ventilation System, which provides cold combustion air for the fire**, places and fire rooms, and which provides in case of an emergency full purge of the relevant fire room, with a purge rate of at least 80 times the room volume.

# live fire training

**Temperature Monitoring System,** which automatically shuts down the system at temperatures of 250°C in one metre room height. This figure was taken into the standard to protect trainees during a live fire trainee from injuries in case they panic and stand up. In such a case, temperatures above 250°C would melt the facemask and/or face shield.

**Pilot Flame Management System,** which continuously monitors the pilot flame. In case of a failure, all gas supplies will be shut down automatically from the operating system.

**Pilot Gas Supply and Pilot Combustion Air Supply are separate from Main Gas Supply and Main Combustion Air supply,** meaning that we have independent systems.

**Smoke Production** must be created by non-toxic and environmentally safe smoke fluids, which are also biologically degradable. The smoke and the smoke fluid should not interfere with the operating system, nor cause any harm to the system's operational parts.

**Emergency Stop Buttons** are installed in each fire room at specific locations, so that even collapsed people who fall down can reach the button. Also each pendant and on the control console in the control room an emergency button is installed. Pushing a button causes the system to immediately stop all gas and smoke supplies and run the ventilation system on full purge. All systems include local and remote safety shutdowns.

**Refractory Material.** Each burn room of the construction has to be protected against heat and flames and the thermal shock, which is caused when applying cold water to the heated up surfaces. Modern cladding is either made of Cot-Ten-Steel, a steel type, which absorbs best the thermal shock, or special firebricks.

**Certified System.** All modern live fire-training systems have to be approved by an internationally recog-



Pic courtesy of Draeger Safety

nized testing institute or laboratory, such as TÜV etc. A certificate from this authority must be an initial part of the documents, delivered with the system.

**Training and Trouble-Shooting.** The manufacturer must provide a training to the instructors of the end-user which contains of instructions for use and operation, trouble-shooting and the special behaviour of gas fires simulating all fire classes, A, B and C.

The previously mentioned standard DIN 14097, part 2, the standard DIN 14097, part 1 – the construction of fire houses – local standards for gas and

electrical installations and NFPA regulations NFPA 1402, 2002 edition – guide to building Fire Service Training Centres –, NFPA 54 and NFPA 58 and NFPA 86 used in combination provide utmost safety and reliability of the delivered system.

## PLC CONTROLLED SYSTEMS

With a PLC-controlled system, all operations of the system are handled by a PLC. The integrated safety features are automatically controlled by the system. The smoke production, the choice of the fire places and the fire sizes, however,

*The manufacturer must provide a training to the instructors of the end-user which contains of instructions for use and operation, trouble-shooting and the special behaviour of gas fires simulating all fire classes, A, B and C.*





are manually controlled and operated by the instructor. He decides whether the trainees have fought the fire in a correct and proper way, whether they have used the right tactical strategies and whether they have applied the right agent and the right amount of agent. With his manual controls, the instructor can increase and decrease the flames, he can set up single- and multiple fire scenarios and he can reduce smoke or he can increase the opacity level.

#### COMPUTER CONTROLLED SYSTEMS

Such a system is an upgrade of a PLC-controlled system. Fire Scenarios and Fire Scenario Parameters can be pre-set to run on automatic modes. These functions are available for single and multi-fire scenarios.

The computer workstation and operating software inside a control room allows the pre-setting of the following variable parameters:

- Flame height above the prop: from 0 – 100 %. Depending on the education level and experience of the trainees this feature can be set up. Together with the client, the supplier sets up these features during the commissioning and training phase. Besides the flame size in per cent also the duration of the burning flame can be pre-selected.
- Flame developing time in seconds, by steps from 1 to X seconds. According to the experience level of the trainees performing such an exercise, for the first time they may require a longer time to prepare themselves compared to those who have already been in a fire room. The duration of fires and exercises can be adjusted individually.
- Flame spread in seconds by steps from 1 to X seconds.
- Extinguishing method, time and temperature dependent. However, this feature the supplier configures within the software within a value of multiple features. It makes no sense to detect a successful session just by one of these figures. Reality tells that only if a certain temperature

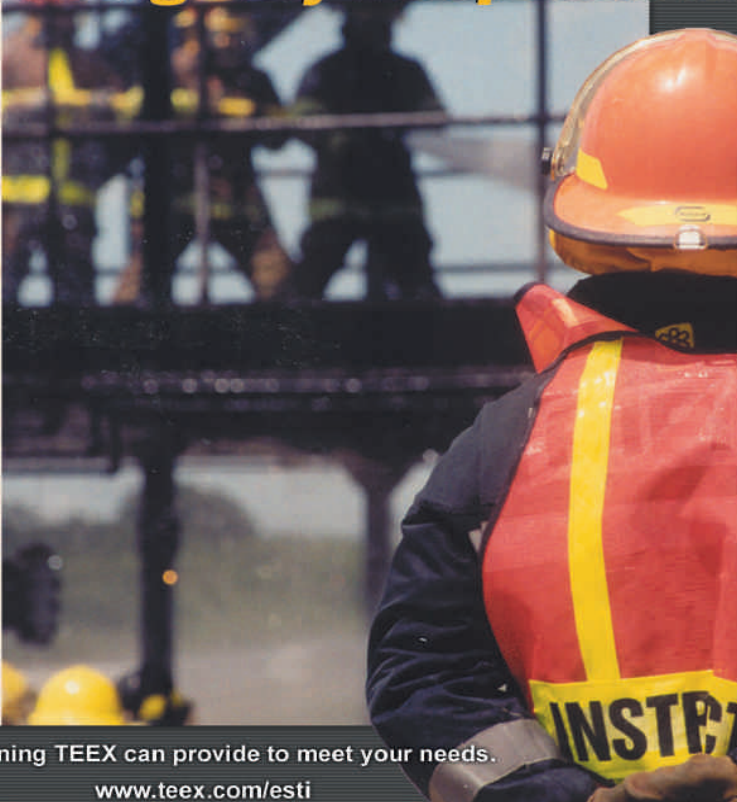
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drop within a certain time and with the application of a certain amount of extinguishing media is detected, a realistic detection is given. Otherwise, if only temperature drop or amount of agent or time is detected, non realistic data will conclude a training session as successful when it was not.

- Extinguishing temperature, as the chapter before, set up from min. X° Celsius to max. °C above the prop and within the room.
- Watering time after fire is extinguished, as above.
- Re-ignition time in seconds from 1 to x seconds in steps.
- Smoke status, as shown previously on the smoke pre-selection screen, with the effect of a smouldering fire and smouldering time.
- Chain reaction, operation of various fire places in a row.
- Time delay from one fireplace to another fireplace.
- Touch screens on control console for immediate demands for the system.
- Simple symbols for repeated demands and for alarm signals and messages.
- Acoustic warning system in case of wrong operation, message flashing.

#### STORAGE OF OTHER OPERATING DATA:

- Which operator was where at which time and for how long on duty.
- Record of operating faults, to be visual only with key lock for certain persons.
- Instructor at site, duration of training sessions.

#### CUSTOMER TAILORED SOLUTIONS

As a conclusion, gas fuelled, PLC and computer controlled hot live fire training systems offer various advantages compared to conventional training methods, including safety and environmental compliance.

The main goal: effective training under the highest safety conditions for trainees and instructors, realistic scenarios and reliable training strategies that can be tailored to each customer's needs.



*Pic courtesy of Draeger Safety*



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## MERSEYSIDE FIRE & RESCUE AWARDS URBAN SEARCH & RESCUE (USAR) PPE CONTRACT TO BRISTOL UNIFORMS



With increasing interest now being shown in the adoption of specialist PPE for urban fire and rescue work, Merseyside Fire Service is amongst the first in the UK to award a contract for the supply of dedicated USAR ensembles.

Designed to be lightweight and highly flexible, the **Bristol Uniforms'** solution is a jacket and trouser combination incorporating a red outer layer, Goretex™ lining and 3M High Vis™ trim. Without the need for a thermal barrier the combination is particularly suited for use by search and rescue teams working in confined spaces where the need for protection whilst crawling amongst debris is a key requirement.

A special feature of the combination is the use of a special zip fastening which securely connects the jacket to the trousers to maintain the integrity of the ensemble under difficult entry and search conditions.

The contract, to be delivered in late Spring 2005, marks Bristol Uniforms' entry into the USAR PPE market and is the first major contract to be secured by the company. Meanwhile a number of other fire and rescue services in the UK are showing a particular interest in the Bristol Uniforms' design which has drawn heavily on the Ergotech™ and Ergotech Action™ lightweight combinations which have proved so popular since their introduction to help reduce the worst effects of heat stress in firefighter PPE.

Commenting on Bristol's first success in this area, Roger Startin, the company's joint MD, pointed to the contribution the company's R&D had made to designing a winning combination. "With the emphasis increasingly on using different PPE for different hazards such as structural firefighting, USAR and RTA work, our investment in trialling new fabric combinations, with the particular focus on weight reduction, has started to pay major dividends". "We are delighted Merseyside have chosen our new design and look forward to supplying other fire and rescue services over the coming months".

**For more information about Bristol Uniforms or Bristol Care please contact either:**

**Roger Startin, Bristol Uniforms Ltd on 0117 956 3101 or email [roger.startin@bristoluniforms.co.uk](mailto:roger.startin@bristoluniforms.co.uk)**  
**Or Richard Storey, RSL Associates on 01749 870652 or email [rsi@lineone.net](mailto:rsi@lineone.net)**

## COMPACT GAS DETECTION IN NEW DRAEGER X-AM 3000



Compact and light in weight, the new **Draeger X-am 3000** is an innovative 3 or 4 gas warning device. Providing reliable monitoring of H<sub>2</sub>S, CO, O<sub>2</sub> and combustible gases and vapours in ambient air, it is ideal for use in any application requiring portable

gas detection, including confined space.

Featuring state of the art electronics as well as Draeger sensors for a fast, accurate response to changing gas concentrations, the X-am 3000 is easy to use. Utilising simple three-button operation, it also boasts straightforward menu selection and a large display for measurement identification. The precalibrated electrochemical sensors and the catalytic sensor are automatically recognised and provide precise and reliable measuring results.

Rugged in design and protected against dust and water as standard, it offers reliable operation in all environments. Incorporating

a scratch resistant display to ensure that gas concentrations can be easily read, it is also available with an optional rubber-boot to provide additional protection from mechanical and impact damage.

In addition to audible and visual alarms, a vibrating alarm is integrated in the instrument. The functionality and battery status are monitored continuously and will, if necessary, generate an alarm.

The TWA and STEL are also automatically evaluated and different audible alarm levels indicate pre and main alarm conditions.

Integral software means that, when using a defined gas mixture, the instrument can be calibrated by pressing a single button. In addition, a peak hold mode is available for confined space entry applications. For extended monitoring purposes, a datalogger is optionally available to record gas concentrations and alarms for up to 40 hours. An internal pump with a 10m tube can also be supplied for use in confined or difficult to reach areas.

Both NiMH and alkaline batteries are available and can be interchanged and, for maximum flexibility, there are a number of different charging options, including a car charger for off-site use.

Measuring 90 x 140 x 55mm and weighing just 550g, the X-am 3000 meets ATEX, UL and CSA approvals.

**Further information is available from:**

**Richard Beckwith, Draeger Safety UK Limited,  
Ullswater Close, Kitty Brewster Ind Est., Blyth,  
Northumberland NE24 4RG.**

**Tel: 01670 352891  
Fax: 01670 356266**

## NEW "TWO-IN-ONE" EXPLOSIVE GAS AND OXYGEN MONITOR FROM DRAEGER BRINGS COST SAVING BENEFITS



Explosive hazards and a lack or surplus of oxygen can easily be kept under control with the new **Draeger PacEx2**. Featuring state-of-the-art technology and combining extended operational time with minimal training and charging time requirements, this robust, handheld monitor also incorporates Draeger's longer-life sensors to further increase the cost savings benefits.

Developed for use in oil and gas refineries as well as in mining, chemical, shipping, utilities and waste disposal applications, this portable two-in-one instrument can also be

used for the certification of safe work areas. In addition, it is ideal for monitoring workplaces where low concentrations of gas are constantly present, and in confined space or difficult to reach areas. Firefighters and civil defence organisations will also find it useful in the evaluation of combustible hazards during emergency situations.

For maximum flexibility, the PacEx2 can be supplied in two versions: as an instrument for explosive gas measurement, or as a "plug and play", combination instrument for explosive gas and oxygen measurement. Designed to monitor hazard concentrations continuously, simultaneously and independently, it has a short response time and emits vibrating, audible and visual alarms as soon as the alarm thresholds are reached.

Utilising three functional pushbutton controls, the PacEx2 offers two menus: a quick menu and a password protected version. The quick menu provides access to the fresh-air calibration and a read-out of the four-hour Ex-average concentration. Once entered, the four-digit password will allow configuration and calibration of the instrument to either LEL (various gases and vapours) or % vol ranges (methane), and the two adjustable alarm thresholds may also be set.

Operational as soon as they are plugged into the instrument, the electrochemical sensors feature "smart" technology and have

# Product Update • Product Update • Product Update

an internal data memory. Three kinds of oxygen sensors can be used with warranties of 5, 3 or 2 years and expected sensor lives of 5, 3 and 2 years respectively.

With built-in datalogging capability, the unit can also be used in conjunction with Draeger's PC software, Gas Vision. Able to display and analyse the measurement values stored within the PacEx2, Gas Vision can show them graphically and in table form. Obviously, this functionality allows all data to be stored in the PC and exported to other software programs as required. In addition, the PacEx2 can be individually configured to meet different requirements, including device calibration, instrument configuration and language changes (to English, French, German and Spanish), by using Draeger's CC Vision software.

**Further information is available from:**  
**Richard Beckwith, Draeger Safety UK Limited,**  
**Ullswater Close, Kitty Brewster Ind Est., Blyth,**  
**Northumberland NE24 4RG.**  
**Tel: 01670 352891**  
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## THE IVECO MAGIRUS AIRPORT RECEPTION COMMITTEE



The protective fire safety on airports is generally considered to be one of the most complex and greatest challenges for the fire services – and thus also for all manufacturers of fire fighting vehicles. IVECO MAGIRUS offers a world-wide unique product range for

holistically covering all potential hazards that must be met on airports.

For the protection of buildings and facilities, IVECO MAGIRUS offers a wide range from command vehicles via first-intervention vehicles, light and special fire fighting vehicles to various different turntable ladders and aerial telescopic platforms with a rescue height of up to 54 m. Rescue vehicles and equipment carriers as well as swap body vehicles with a large roll-off container program complete the range.

With the airport crash tender range DRAGON x4, x6 and x8, IVECO MAGIRUS offers three variants in this "top of the range" category, that will meet even the most specific requirements. Real powerhouses in the form of currently unrivalled high-performing IVECO 1.024 hp or 1.500 hp engines with last generation common-rail injection technology do not only provide for an enormous acceleration but also for an enormous fire fighting power. Up to 6,000 l/min pump capacity, 14,000 litres fire fighting agents in a combination of water, powder, and foam as well as precise monitors with long throw ranges guarantee a fast and effective fire fighting operation.

The excellent cross-country capabilities of these vehicles provide for an unrestricted mobility and ensure that fire fighting can also be effected away from the runway without any loss of time.

The IMPACT series, with the variants x4 and x6, is the ideal completion to the DRAGON range or even a cost-effective alternative, e.g. for smaller airports. Based on highly cross-country capable, single tyre IVECO four-wheel-drive chassis, these vehicles are

extremely mobile but nevertheless equipped with an impressive fire fighting power: depending on vehicle type up to 12,000 litres of fire fighting agent can be carried on board. This concept has been very much proven in practice as is shown by the more than 150 IMPACT vehicles that are currently in world-wide operational use at airport fire service departments.

A network of service stations available on a 24h basis in almost 150 countries around the globe ensures that IVECO MAGIRUS vehicles remain ready for operation at any time.

**For more information contact:**  
**Alfred Bidlingmaier**  
**Tel: +49 731 408 2566**  
**Email: [alfred.bidlingmaier@iveco.com](mailto:alfred.bidlingmaier@iveco.com)**

## THE INTERTECH GROUP ACQUIRES PBI BUSINESS, FORMS PBI PERFORMANCE PRODUCTS, INC.



The InterTech Group, Inc. has announced the purchase of the polybenzimidazole

fiber and polymer business (PBI) from Celanese Corporation (NYSE: CE). PBI Performance Products, Inc. was formed to complete the acquisition and operate the business as a wholly owned subsidiary of InterTech. All existing management and employees will remain with the business providing a seamless transition for customers and suppliers. Terms of the transaction were not disclosed.

"The InterTech Group has a strong track record of fostering the entrepreneurial spirit within its member companies", remarked Grant Reeves, President of PBI. "For PBI and its employees there will be a committed and focused owner who will support our customers' needs and grow the business. The PBI business has an impressive portfolio of technology that has been effectively commercialized in the fire service sector. Our goal is to realize PBI's potential in new commercial applications built on years of extensive R&D. This commitment to development activities will advance the practical uses of PBI in our chosen industries."

Bill Lawson, PBI's Managing Director & COO, says, "PBI has a strong commitment to its business relationships which is fully supported by our new ownership. We can now act more quickly to the opportunities presented by the market. We are excited to make a new start."

PBI polymer and fibers were developed for NASA to provide unprecedented fire protection. Primary products include branded fibers and fabrics for fire service and industrial protective wear, molded shapes and parts for semiconductor and industrial applications, and films for the emerging proton exchange membrane (PEM) fuel cell market.

In Fire Service, PBI Matrix® and PBI Gold® brands are recognized by fire departments worldwide as the gold standard of protection. For Industrial and Electrical workers, PBI Gold® and PBI Triguard™ brands are recognized as the premier of lightweight protective apparel. Under the trade name Celazole®, PBI polymer is used to make high performance compression and injection molded PBI parts for semiconductor and electronic manufacturing tools; for industrial wear and friction applications, and thermal insulation parts.

Headquarters for the business will remain in Charlotte, North Carolina with manufacturing in Rock Hill, South Carolina.

The InterTech Group is a holding company and operator of a diverse, global group of companies specializing in custom engineered solutions. InterTech products can be found in a wide variety of industries and applications, including aerospace, power generation, medical, hygiene, sporting goods, home furnishings and construction materials.

**For more information contact:**  
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**Tel: 1 704 554 3378**  
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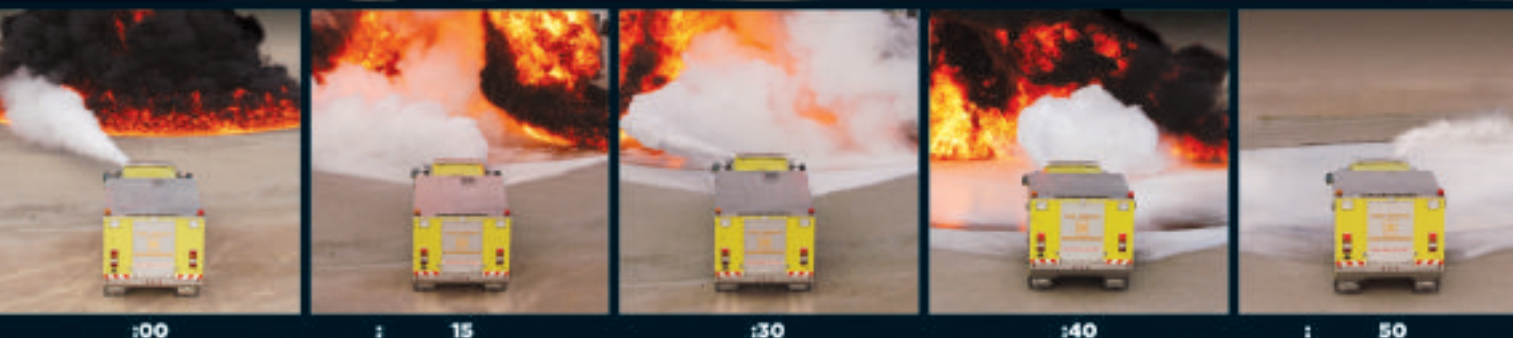
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## COMMENT

Welcome to issue 8 of International Fire Fighter magazine. As I write this I look back and wonder at just how quickly 2005 has passed and what we have achieved and what plans we have for 2006. Next year will be a very exciting year for us. We have been in discussions with Pennwell who organise the USA's largest fire exhibition in Indianapolis, the FDIC. As you will see from the logos on this issue's front cover, International Fire Fighter has been given the prestigious award of being the official international magazine for FDIC Indianapolis which takes place next year from April 24th-29th. International Fire Fighter is also the official international title for two other FDIC events which take place in Cologne from the 30th March to April 2nd and in Bahrain from the 6th to 10th May.

I would like to use this issue's comment to thank Pennwell for bestowing upon us the official international magazine status for FDIC Indianapolis, Cologne and Bahrain. Over the next two issues, International Fire Fighter will publish news about these events and I do hope that I get to see customers old and new attending these very important shows.

Mark Bathard  
Sales and Editorial Manager





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# A Guide to Selecting a Fire Apparatus Manufacturer

By Jeff Aiken

*Pic courtesy of E-One*

SELECTING A FIRE APPARATUS MANUFACTURER is an important decision. It is a decision that should involve more than just choosing a company that meets your specs or is the lowest bidder. Specifically, it should involve gathering and evaluating information about the manufacturer, the dealer, and the product itself to ensure you are getting the best overall value for your money. This information will allow you make an informed selection that you can confidently present to your town council, city manager, or board of fire commissioners to justify your choice.

The easiest way to gather this information is to submit a questionnaire to bidders to complete as part of their bid packages. That way, you'll be sure to ask each bidder the same questions in order to make an impartial evaluation. A sample questionnaire is included at the end of this guide. You may photocopy it, or you may use it as a basis for developing your own questionnaire.

## MANUFACTURER INFORMATION

The first step in the information gathering process is to learn more about each manufacturer. This will help you determine their experience, financial stability, quality record, and other valuable information.

**Experience.** Fire apparatus manufacturers with a lot of experience know what works and what doesn't. They know the applicable vehicle standards and have kept up with the changes over the years. They have helped develop new fire apparatus technology and have incorporated it into their vehicles. This experience can be measured in terms of the years of operation and the number of apparatus built. It can also be measured in terms of satisfied customers. Here are some questions you may want to ask prospective bidders:

- How long has the manufacturer been building fire apparatus?
- How many fire apparatus has the manufacturer built?
- How many fire apparatus has the manufacturer built of the specific type you want to purchase (pumper, aerial ladder, rescue, etc.)?
- Can the manufacturer provide the names of at least ten customers who are operating fire apparatus of the specific type you want to purchase?

**Ownership.** In today's complicated business world, it is not uncommon to discover that some well-known fire apparatus manufacturers are actually owned by larger corporations. Make certain you investigate or research the parent corporations to thoroughly understand their background and relationship with the apparatus manufacturer. To find out about ownership, ask prospective bidders:

- Is the manufacturer owned or controlled by another corporation? If so, what is the name of the parent corporation and what is their primary business?
- How long has the manufacturer been owned by the parent corporation?
- Does the parent corporation own any other fire apparatus manufacturers? If so, what are their names?

**Financial Stability.** There are more than one hundred fire apparatus manufacturers in the United States today. It is an extremely competitive market, and only the most financially stable companies can survive. Over the past twenty years, dozens of manufacturers — both large and small — have gone out of business and left their customers without a source of parts, service, and warranty support. To determine a manufacturer's financial stability, ask them:

- Will the manufacturer provide a copy of their most recent annual report with their bid for review by the city or department finance officer, risk manager, or other designated person?
- Will the manufacturer provide a copy of their most recent financial statement with their bid for review by the city or department finance officer, risk manager, or other designated person?

**Product Line.** When you purchase a fire apparatus, you are establishing a long-term relationship with the manufacturer and dealer for parts, service, and warranty support over the life of the vehicle. Dealing with a manufacturer and dealer who can offer a broad product line is often more efficient and cost-effective than having to go one place for a pumper, another for an aerial, and somewhere else for a brush truck. To learn more, ask:

- What kinds of apparatus does the manufacturer build? (Alternatively, inquire if the manufacturer builds specific types of apparatus you may need in the future — aerials, tankers, wildland pumpers, etc.)
- Does the manufacturer offer their apparatus on both custom chassis and commercial chassis to allow flexibility in design and cost?



- Does the manufacturer offer their apparatus on light-duty, medium-duty, and heavy-duty trucks to allow flexibility for specific applications?

**ISO (International Standards Organization) Certification.** The International Standards Organization sets quality standards for business operations worldwide. ISO certification is more than just a buzzword. A manufacturer must allow an independent, third-party agency to inspect all aspects of their quality systems and then must allow that same agency to conduct audits every six months. ISO 9001 is the most comprehensive certification. It measures quality in the areas of design, manufacturing, and service — everything from taking the initial order to providing service in the field. Other ISO certifications are less comprehensive. Ask bidders:

- Is the manufacturer ISO 9001 certified?
- If the manufacturer is not ISO 9001 certified, state the ISO certification level and the areas covered in the scope of certification.

**Bonds and Insurance.** What happens when a manufacturer is awarded a contract and then decides not to build the apparatus or is unable to meet the specs? And what happens if they build it, and it fails? A bid bond compensates the customer if a manufacturer is awarded the contract, but then backs out of the deal. A performance bond compensates the customer if an apparatus is built, but does not meet the specifications. Liability insurance covers damage, injury, or death resulting from a failure of the apparatus. Bonds and insurance are part of the cost of the apparatus, but larger companies with good records can obtain them at lower rates. Ask bidders:

- Will the manufacturer provide a bid bond for 10% of the total bid? (Bid bonds must be from the apparatus manufacturer — bonds from sub-contractors are not acceptable.)
- Will the manufacturer provide a performance bond for 100% or more of the total bid?  
If so, how much will it cost (cost per \$1,000)? (Performance bonds must be from the apparatus manufacturer — bonds from the salesperson or from sub-contractors are not acceptable.)
- Will the manufacturer provide a \$25,000,000 product liability insurance policy?

**Lease/Purchase Options.** Writing an apparatus spec that meets your needs can take a lot of effort. You shouldn't have to go through the same amount of effort to find a finance plan that also meets your needs. Some manufacturers can't offer you any finance help — they just want to sell you the apparatus. Larger manufacturers can offer you a wide variety of lease and purchase plans. To determine your options, ask:

- Does the manufacturer offer finance options? If so, describe them.
- Does the manufacturer offer leasing options? If so, describe them.

**Customer Support.** Most customer support is provided by the local apparatus dealer.

However, some manufacturers offer additional support directly to their customers.

Training programs and refurbishment centers are among the most valuable kinds of factory-sponsored customer support. Inquire about these programs by asking:

- Does the manufacturer have a training program for vehicle operators? Does the training take place at the fire department site and does it last for more than one day to ensure the operators are familiar with all modes of operation and with the proper preventive maintenance procedures?
- Does the manufacturer have a training program for fire mechanics and emergency vehicle technicians? Does the program cover all models in the manufacturer's product line? Does the program also include review courses to prepare students for EVT Certification Commission exams?
- Does the manufacturer have a factory-operated facility to perform major repair, refurbishment, and rehabilitation of fire apparatus? Does the refurbishment work comply with the requirements of NFPA 1912?
- List any other customer support services offered by the manufacturer.

## DEALER INFORMATION

The dealer is an equally important factor in selecting an apparatus manufacturer. For many departments, the dealer will be the main source of parts, service, and warranty support. The dealer sales personnel can also provide information about the latest changes in technology and applicable standards.

**Experience.** Experienced dealers with experienced personnel can often give you the best support. This can be measured by the number of years they have been in business and the number of apparatus they have sold. Their experience and level of support can also be measured by their satisfied customers — other departments in your area. Ask bidders:

- How long has the dealer been selling fire apparatus? How long has the dealer been selling this brand of apparatus? Is the dealer strictly dedicated to selling fire apparatus or do they sell and service other products?
- What is the average number of years of experience of the dealer's sales personnel?
- How many fire apparatus has the dealer sold?
- Can the dealer provide the names of at least ten customers who are operating fire apparatus of the specific type you want to purchase?

**Parts and Service.** When fire apparatus have problems, they need to be resolved quickly. That's why it is important to select dealers who offer parts and service support from qualified personnel when and where you need it. Inquire by asking:

- Does the dealer have one or more parts and service facilities? If so, list the locations.
- What services are available and what are the service department hours of operation at each location?
- Does the dealer have one or more mobile service units to provide service in the field? If so, state the services provided, areas covered, and the hours of operation.
- Are all the service technicians factory trained? Are they EVTCC certified? Can you provide a list of certified service personnel and their certifications for each location?
- What parts are available and what are the parts department hours of operation at each location?
- What is the average delivery time for parts not in stock?

**Insurance.** If the dealer is going to be providing parts and service for your apparatus, it is important for them to have liability coverage for the work they do. It is also important to make sure they have damage coverage for the time your apparatus is in their possession. To protect yourself, ask:

- Does the dealer have liability insurance? If so, how much?
- Does the dealer have damage coverage for the time the apparatus is in their possession? If so, how much and what damage is covered?

## PRODUCT INFORMATION

In addition to being concerned with the details of the particular apparatus you are specifying, you should also ask bidders about their products in general. This will help you understand their engineering, testing, and manufacturing capabilities, as well as the types of warranties they offer.

**Engineering.** A fire apparatus is a complex vehicle with many unique components and systems. To ensure the apparatus performs properly, it needs to be designed by qualified and experienced engineers. The engineers must consider weight distribution, structural stresses, electrical loads, safety, performance, and ease of maintenance for the life of the apparatus. The best way to do this is to have the same team of engineers design all the major portions of the vehicle — the cab, chassis, body, electrical system, and aerial devices. That way, they can make sure everything fits together and works together. Ask bidders:

- Does the manufacturer have an engineering staff? If so, how many full-time degreed engineers are employed? What is the average number of years of experience of these engineers?
- Does the engineering staff design the cab, chassis, body, electrical system, and aerial devices on their fire apparatus? (Only the body, electrical system, and aerial devices portions apply for vehicles built on commercial truck chassis.)
- Can the engineering staff provide an accurate weight distribution analysis, electrical load analysis, and engine/transmission performance analysis before the apparatus is built?



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- Does the engineering staff use the latest versions of computer-aided design (CAD) and analysis tools?

**Manufacturing.** Building a fire apparatus requires as much skill as designing it. Just as with engineering, the best way to do this is to have an experienced team of workers build all the major components. It also helps to integrate the engineering and manufacturing functions so that the output of the engineering computer-aided design tools becomes the input for the manufacturing computer-aided manufacturing tools. To determine a bidder's manufacturing capabilities, ask them:

- How many full-time manufacturing workers are employed? What is the average number of years of experience of these workers?
- Does the manufacturing staff build the cab, chassis, body, electrical system, and aerial devices on their fire apparatus? (Only the body, electrical system, and aerial devices portions apply for vehicles built on commercial truck chassis.)
- Are all welders certified? State the certification required for each welded component on the apparatus.
- Does the manufacturing staff use the latest versions of computer-aided manufacturing (CAM) tools?

**Standards Compliance.** Building a fire apparatus that does not fully comply with applicable vehicle standards can put the manufacturer and the customer in a position of serious liability if an accident occurs. This is true for mandated standards, such as the Federal Motor Vehicle Safety Standards (FMVSS), as well as for those standards that are widely accepted by other manufacturers in the industry, such as NFPA and KKK.

Some manufacturers will try to cut costs by complying with only certain parts of these standards. Don't accept such apparatus. Ask each bidder:

- Does the apparatus you are bidding comply with all portions of the applicable vehicle standards? (NFPA 1901 or NFPA 1906 for fire apparatus; KKK-A-1822E and/or state standards for ambulances; FMVSS for all vehicles.)

**Testing.** Some manufacturers perform little or no testing when they introduce new apparatus or components. Others perform only the minimum tests required by the FMVSS and NFPA or KKK standards, but nothing else. To ensure that new apparatus designs will function properly – both now and in the future – a manufacturer needs to perform a series of computer analyses and prototype tests of all critical components and systems. To determine how much testing has been done on a particular apparatus design, ask:

- Has the manufacturer performed a fatigue life analysis and testing of all structural components on the apparatus model being bid? State which tests and the results.
- Has the manufacturer conducted ride quality testing on the apparatus model

being bid? State which tests and the results.

- Has the manufacturer conducted cab crashworthiness testing on the apparatus model being bid? State which tests and the results.
- Has the manufacturer conducted load testing of the aerial device on the apparatus model being bid (if applicable)? Does this testing include personnel load, equipment load, static waterway load, and elevated monitor nozzle reaction loads both vertically and horizontally? State which tests and the results.
- Has the manufacturer conducted any other analyses or tests as part of the development of the apparatus model being bid? State which tests and the results.

**Third-Party Verification.** Having a manufacturer test apparatus is good, but having an independent, third-party organization conduct their own tests is even better. And best of all is to have an independent, third-party organization not only conduct the tests, but also verify the overall design. To determine whether a manufacturer has used third-party testing and verification, ask bidders:

- Has the manufacturer submitted their products to an independent, third-party company for testing? If so, state which components or systems and the results.
- Has the manufacturer submitted their products to an independent, third-party company for verification of the design? If so, state which components or systems and the results.
- Will the independent, third-party company provide written certification of the test results and verifications?

**Warranty.** Some fire apparatus manufacturers offer only limited warranty coverage for their products. After a year or two, their customers are responsible for all problems – even if it was the manufacturer's fault. Other manufacturers offer longer warranties on certain components, but put hidden restrictions on the coverage. For example, they might give a lifetime warranty on the frame rails, but give no warranty on the frame crossmembers. To determine the warranties offered by manufacturers, ask them:

- What is the vehicle frame and frame crossmembers warranty?
- What is the cab structural warranty?
- What is the body structural warranty?
- What is the paint warranty?
- What is the pump warranty (if applicable)?
- What is the pump plumbing warranty (if applicable)?
- What is the water tank warranty (if applicable)?
- What is the aerial device warranty (if applicable)?
- What is the standard warranty for all components manufactured by the apparatus manufacturer and not covered above?

- Are there any other specific warranties – either from the manufacturer or from a component supplier? If so, state what and how long.

## Manufacturer, Dealer, and Product Questionnaire

Each bidder is to complete all portions of this questionnaire and submit it with their bid.

Failure to do so will render their bid non-responsive.

### MANUFACTURER INFORMATION

#### Experience

- How long has the manufacturer been building fire apparatus?
- How many fire apparatus has the manufacturer built?
- How many fire apparatus has the manufacturer built of the specific type you want to purchase (pumper, aerial ladder, rescue, etc.)?
- Can the manufacturer provide the names of at least ten customers who are operating fire apparatus of the specific type you want to purchase?

#### Ownership

- Is the manufacturer owned or controlled by another corporation? If so, what is the name of the parent corporation and what is their primary business?
- How long has the manufacturer been owned by the parent corporation?
- Does the parent corporation own any other fire apparatus manufacturers? If so, what are their names?

#### Financial Stability

- Will the manufacturer provide a copy of their most recent annual report with their bid for review by the city or department finance officer, risk manager, or other designated person?
- Will the manufacturer provide a copy of their most recent financial statement with their bid for review by the city or department finance officer, risk manager, or other designated person?

#### Product Line

- What kinds of apparatus does the manufacturer build? (Alternatively, inquire if the manufacturer builds specific types of apparatus you may need in the future – aeriels, tankers, wildland pumpers, patient transport vehicles, etc.)
- Does the manufacturer offer their apparatus on both custom chassis and commercial chassis to allow flexibility in design and cost?
- Does the manufacturer offer their apparatus on light-duty, medium-duty, and heavy-duty trucks to allow flexibility for specific applications?

#### ISO (International Standards Organization) Certification

- Is the manufacturer ISO 9001 certified?
- If the manufacturer is not ISO 9001

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certified, state the ISO certification level and the areas covered in the scope of certification.

## Bonds and Insurance

- Will the manufacturer provide a bid bond for 10% of the total bid? (Bid bonds must be from the apparatus manufacturer — bonds from sub-contractors are not acceptable.)
- Will the manufacturer provide a performance bond for 100% or more of the total bid?  
If so, how much will it cost? (Performance bonds must be from the apparatus manufacturer — bonds from the salesperson or from sub-contractors are not acceptable.)
- Will the manufacturer provide a \$25,000,000 product liability insurance policy? If so, how much will it cost?

## Lease/Purchase Options

- Does the manufacturer offer finance options? If so, describe them.
- Does the manufacturer offer leasing options? If so, describe them.

## Customer Support

- Does the manufacturer have a training program for vehicle operators? Does the training take place at the fire department site and does it last for more than one day to ensure the operators are familiar with all modes of operation and with the proper preventive maintenance procedures?
- Does the manufacturer have a training program for fire mechanics and emergency vehicle technicians? Does the program cover all models in the manufacturer's product line? Does the program also include review courses to prepare students for EVT Certification Commission exams?
- Does the manufacturer have a factory-operated facility to perform major repair, refurbishment, and rehabilitation of fire apparatus? Does the refurbishment work comply with the requirements of NFPA 1912?
- List any other customer support services offered by the manufacturer.

## DEALER INFORMATION

### Experience

- How long has the dealer been selling fire apparatus? How long has the dealer been selling this brand of apparatus? Is the dealer strictly dedicated to selling fire apparatus or do they sell and service other products?
- What is the average number of years of experience of the dealer's sales personnel?
- How many fire apparatus has the dealer sold?
- Can the dealer provide the names of at least ten customers who are operating fire apparatus of the specific type you want to purchase?

## Parts and Service

- Does the dealer have one or more parts and service facilities? If so, list the locations.
- What services are available and what are the service department hours of operation at each location?
- Does the dealer have one or more mobile service units to provide service in the field? If so, state the services provided, areas covered, and the hours of operation.
- Are all the service technicians factory trained? Are they EVTCC certified? Can you provide a list of certified service personnel and their certifications for each location?
- What parts are available and what are the parts department hours of operation at each location?
- What is the average delivery time for parts not in stock?

## Insurance

- Does the dealer have liability insurance? If so, how much?
- Does the dealer have damage coverage for the time the apparatus is in their possession? If so, how much and what damage is covered?

## PRODUCT INFORMATION

### Engineering

- Does the manufacturer have an engineering staff? If so, how many full-time degreed engineers are employed? What is the average number of years of experience of these engineers?
- Does the engineering staff design the cab, chassis, body, electrical system, and aerial devices on their fire apparatus? (Only the body, electrical system, and aerial devices portions apply for vehicles built on commercial truck chassis.)
- Can the engineering staff provide an accurate weight distribution analysis, electrical load analysis, and engine/transmission performance analysis before the apparatus is built?
- Does the engineering staff use the latest versions of computer-aided design (CAD) and analysis tools?

### Manufacturing

- How many full-time manufacturing workers are employed? What is the average number of years of experience of these workers?
- Does the manufacturing staff build the cab, chassis, body, electrical system, and aerial devices on their fire apparatus? (Only the body, electrical system, and aerial devices portions apply for vehicles built on commercial truck chassis.)
- Are all welders certified? State the certification required for each welded component on the apparatus.
- Does the manufacturing staff use the latest versions of computer-aided manufacturing (CAM) tools?

## Standards Compliance

- Does the apparatus you are bidding comply with all portions of the applicable vehicle standards? (NFPA 1901 or NFPA 1906 for fire apparatus; KKK-A-1822E and/or state standards for ambulances; FMVSS for all vehicles.)

## Testing

- Has the manufacturer performed a fatigue life analysis and testing of all structural components on the apparatus model being bid? State which tests and the results.
- Has the manufacturer conducted ride quality testing on the apparatus model being bid? State which tests and the results.
- Has the manufacturer conducted cab crashworthiness testing on the apparatus model being bid? State which tests and the results.
- Has the manufacturer conducted load testing of the aerial device on the apparatus model being bid (if applicable)? Does this testing include personnel load, equipment load, static waterway load, and elevated monitor nozzle reaction loads both vertically and horizontally? State which tests and the results.
- Has the manufacturer conducted any other analyses or tests as part of the development of the apparatus model being bid? State which tests and the results.

## Third-Party Verification

- Has the manufacturer submitted their products to an independent, third-party company for testing? If so, state which components or systems and the results.
- Has the manufacturer submitted their products to an independent, third-party company for verification of the design? If so, state which components or systems and the results.
- Will the independent, third-party company provide written certification of the test results and verifications?

## Warranty

- What is the vehicle frame and frame crossmembers warranty?
- What is the cab structural warranty?
- What is the body structural warranty?
- What is the paint warranty?
- What is the pump warranty (if applicable)?
- What is the pump plumbing warranty (if applicable)?
- What is the water tank warranty (if applicable)?
- What is the aerial device warranty (if applicable)?
- What is the standard warranty for all components manufactured by the apparatus manufacturer and not covered above?
- Are there any other specific warranties — either from the manufacturer or from a component supplier? If so, state what and how long.

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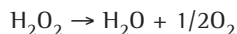


# COMMENTARY ON THE M25 LORRY EXPLOSION

ON 30TH AUGUST 2005, a lorry carrying hydrogen peroxide exploded whilst travelling along the M25 motorway near London. The only person injured was the lorry driver. However, debris from the explosion necessitated closure of all lanes of the motorway in both directions and the truck itself was totally destroyed. Some background on the nature of hydrogen peroxide will take our discussion further.

Hydrogen peroxide, chemical formula  $H_2O_2$ , is perhaps one of the oldest 'industrial chemicals'. Almost two thirds of that produced in the UK is used to bleach wood pulp in the manufacture of paper. Some is used in textiles bleaching, and the substance finds significant application as a reagent in the chemicals industry. It has also found use as a propellant, on its own as a monopropellant or as the oxidising component of a bipropellant.

Hydrogen peroxide decomposes according to:



this reaction being accompanied by the release of 2.5 MJ per kg of the peroxide so reacted.

The hydrogen peroxide explosion on the M25 scattered debris across a wide area and wrecked the vehicle carrying it therefore there must have been a major over pressure. Yet 2.5 MJ  $kg^{-1}$ , though certainly sufficient to sustain a flame, is a low exothermicity in comparison

with, for example, that of natural gas, which releases about 55 MJ per kg of natural gas reacted. The comparison is imperfect in that natural gas needs oxygen, present in air, to burn, whereas what is being considered in the case of hydrogen peroxide is a decomposition flame.

It is widely known that overpressures are related not to the heat of reaction but to the speed of propagation of reaction products. In an oxidation reaction the propagation can be accelerated by thorough pre-mixing of fuel and oxidant, and the highest possible degree of pre-mixing is existence of the fuel and oxidant in the same molecule, that is, oxygen for burning is not atmospheric but intra-molecular. This is the basis of high explosives such as TNT, where the oxygen in the nitro groups reappears in oxides of carbon in the products and there is an exceedingly high overpressure because of the closest possible proximity of fuel and oxidant which are actually different

parts of the same molecule.

The situation with hydrogen peroxide is similar. It is difficult to divide conceptually this very simple, symmetrical molecule into 'fuel' and 'oxidant' as can be done for TNT, but the fact that the exothermicity arises entirely from reaction of a single molecule means that the product gases have high velocity which results in an overpressure. That is the reason for the havoc on the M25 on that ill-fated day.

There are other substances which decompose exothermically with a significant overpressure including hydrazine,  $N_2H_4$ . This, like hydrogen peroxide, has been used as a propellant. Also of course there are organic peroxides of generalised formula:



where R, R' represent alkyl groups, which can explode by a decomposition reaction quite analogous to that of hydrogen peroxide. That is why build-up of such peroxides in chemical plant, for example in a partial oxidation process, is dangerous and needs to be avoided. The reactions discussed in this paragraph have heats of reaction of the order of MJ, not tens of MJ as with hydrocarbon-oxygen reactions, and owe their blast potential to the fact that heat release arises from reaction of a single molecule therefore fuel and oxygen do not have to be brought together.

There have not been many major explosions in the handling and storage of hydrogen peroxide and the author is confident that the recent M25 mishap will establish itself as a 'case study'.

*The hydrogen peroxide explosion on the M25 scattered debris across a wide area and wrecked the vehicle carrying it therefore there must have been a major over pressure.*

By J.C. Jones DSc  
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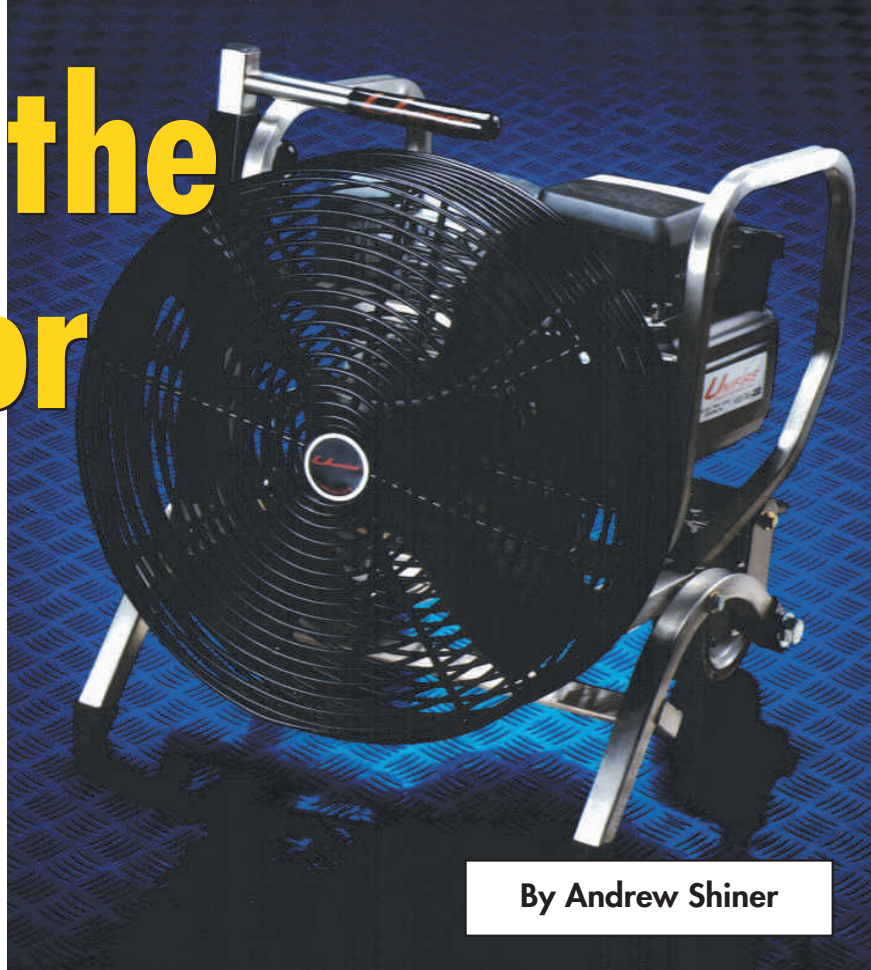
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# Airing the case for PPV

POSITIVE PRESSURE VENTILATION, often more commonly referred to as PPV, has been in use since the 1980s, although it had its origins as far back as the 1950s. Here, Andrew Shiner, Director of Marketing, Europe, Middle East and Africa for Tyco Fire & Security's Fire Suppression Group takes a close look at where PPV stands today and assesses the latest equipment to come onto the market.

The general consensus among professional firefighters around the world is that positive pressure ventilation, when properly used, offers two major benefits; the effective use of PPV increases visibility and significantly reduces air temperature. However, they are equally quick to agree with the importance of the need for training and assessing suitable applications for its deployment.

In reality, ventilation techniques of one sort or another were in widespread use before the introduction of PPV. Along with vertical ventilation and electric smoke ejectors, negative pressure ventilation was used when smoke and fire gases were on the negative side of the fan. These techniques differs from positive pressure ventilation – where the smoke and fire gases are on the side of the fan where the pressure is positive – as they were most often used after the fire was extinguished. The air flow was relatively ineffective and it often took considerable periods of time to ventilate the building.



By Andrew Shiner

*Picture courtesy of Tyco Fire & Security*

## WHAT IS POSITIVE PRESSURE VENTILATION, AND HOW DOES IT WORK?

The principle is that positive pressure is achieved when air is forced into a building using one or more fans. These fans force air into the building or enclosure to create a higher pressure inside the structure in relation to the external atmospheric pressure. This pressure differential drives heat, gases and other products of combustion through a suitable outlet vent to the open air. This also has the benefit of replacing the heat, smoke and gasses in the building with cool fresh air.

In the process, the large quantities of carbon monoxide and the other toxic and carcinogenic products that are present both during and after a fire are removed. This has a welcome impact on the health and safety of the building's occupants and those entering the building to fight the fire. Additionally, PPV can help to maintain primary and secondary exit routes, and assist firefighters to pinpoint the source of the

fire. PPV can also help to reduce the spread of flame and significantly reduce the time-sensitive search and rescue times that can be achieved.

## ANSWERING THE CRITICS' OBJECTIONS

Not everyone accepts the arguments in favour of using PPV. Critics cite the objection that the fan may pick up debris while in operation; that the air stream may pull loose objects into the blade; that petrol-engined PPVs produce carbon monoxide; and that engine vibration may cause the fan to "wander" and so lose its effectiveness. They also express concerns over the size and weight of the equipment.

In practice, these concerns have proven to be unfounded. This is particularly so with the introduction of the latest PPV fans, which overcome the stability, size and weight issues. No one disputes though that proper training is absolutely essential and that the use of PPV needs to be considered as part of the overall firefighting tactical plan.

Tests have shown that the risk of





trapping occupants or firefighters between the fire and the outlet vent is much less than was originally believed and that the benefits far outweigh any potential disadvantages. Concerns that there is a risk of igniting the hot smoke as it mixes with oxygen at the outlet vent have also proved to be unfounded. This is easily controlled by proper training, and by positioning a covering jet at the outlet vent. In fact, all of the recent studies have shown that the likelihood of PPV increasing the risk to occupants of the building are far outweighed by the rapid improvement of the conditions inside the building and the more effective fighting of the fire.

### THE IMPORTANCE OF PROPER CONTROLS

There are though six steps that need to be taken to ensure that PPV techniques are effectively and safely implemented. These can be summarised as the need to:

- Ensure proper training of the firefighting crews.
- Establish effective command and control procedures.
- Establish essential fire ground communications.
- Use the most suitable equipment for the job.
- Adopt the most appropriate application techniques.
- Implement a phased approach to the introduction of PPV.

Brigades need to ensure that the most suitable fan or fans are selected, taking account of fan performance; stowage; maintenance; manual handling and noise levels. Also, PPV should not be adopted as part of the fire ground operations until every member of the fire crew has a thorough appreciation of the use of ventilation, and how this affects the behaviour of fire. It is imperative that PPV needs to be coordinated with other firefighting activities.

So, carrying out a dynamic risk assessment at the site of the fire is essential and there are several questions that need to be answered. These include the size of the compartment to be ventilated; the location of the fire;

the likely location of any casualties and an assessment of backdraught or flashover potential. Wind direction, determining the location of the essential outlet vent and the provision of jets to cover the outlet and possibly nearby structures also need to be taken fully into account.

Where there is a risk of either back-draft or flashover, PPV is clearly not appropriate until proper communications have been established between the fire crew inside the building and the incident commander. It is also not advisable to use PPV in conditions where the wind strength or its direction will thwart the effects of the fan or fans.

### SUCCESSFUL APPLICATION

The successful use of PPV also depends upon on the number and positioning of the fans. Where a single fan is being used it should be positioned so that the stream of air is directed at the centre of the opening, with the cone of pressurised air just covering the aperture. A rule of thumb is to position the fan the same distance from the inlet opening as the aperture height. It is important to ensure that the aperture is properly sealed in this way, otherwise there is the risk that hot gasses and smoke may move towards firefighters.

Where more than one fan is used, these are most effective if placed in series; one behind the other, rather than side by side. The larger fan should be nearest the building – about a metre from the opening – with the smaller

*A rule of thumb is to position the fan the same distance from the inlet opening as the aperture height. It is important to ensure that the aperture is properly sealed in this way, otherwise there is the risk that hot gasses and smoke may move towards firefighters.*

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fan immediately behind, sealing the aperture. With larger openings, it may be necessary to position the fans side by side, although this is less effective and it is preferable to reduce the size of the opening if possible.

It is, of course, essential to create the outlet vent before engaging the PPV fan or fans. Ideally, this should be slightly less than the size of the inlet opening as this helps to ensure a build-up of positive pressure in the building. This may well call for other apertures in the building, such as doors and windows, to be closed. Under no circumstances should the jet positioned at the outlet vent direct water into the building while venting is taking place, as this could put firefighters inside the building at considerable risk.

Few buildings have just one room, floor or enclosure. In such cases, the appropriate technique is to adopt what is known as a sequential approach. This involves providing the maximum volume of pressurised air to ventilate each enclosure in turn. This will inevitably mean manhandling the PPV equipment along corridors or up staircases and is why, if for no other reason, weight and manoeuvrability of the equipment is so important.

### LATEST PPV EQUIPMENT

The latest PPV fan to be introduced by Tyco illustrates the sophistication of the equipment that is now available to brigades. It is the result of a partner-

ship exercise that brought together Tyco, the UK fire service and Unifire Power Blowers. Called the DST-3P4 "Whisper", it provides professional firefighters with a compact and super-quiet unit that meets their precise requirements and addresses all of the issues raised by earlier critics of the use of PPV. It more than satisfies the "wish list" of the UK Fire Brigades PPV Working Group, including being able to elevate the fan by 20 degrees and lower it by ten degrees.

The 460mm DST-3P4 is an unerringly



*Picture courtesy of Unifire Power Blowers*

reliable unit that has the smallest possible dimensions – it will fit into a standard locker – overcoming any size concerns, without compromising performance or in-use stability. Its 96dB(A) noise output at full throttle means that it is considered to have the lowest noise level of any PPV on the market. In fact, it is believed to be the only PPV unit available that is below the 98dB(A) level where, in many countries, ear protection is compulsory.

Its stainless steel frame provides a full 360-degree roll protection, and its one-piece, four-blade Unitron propeller has been described as "virtually indestructible". The DST-3P4 also features a patented 30-position friction-lock tilting lever, step-and-go quick locking brakes, and 203mm off-highway pneumatic wheels that ensure easy manoeuvrability over obstacles such as stairs, steps and curbs.

It also incorporates ergonomically-designed extendable handles to ensure that positioning the DST-3P4 is straightforward and effortless. The DST-3P4 incorporates a new Honda overhead camshaft engine and automatic ignition. Such is the robust engineering and durability that many of the parts carry a full five-year guarantee, and the unit has been tested and approved by AMCA [Air Movement & Control Association], the internationally recognised, US-based PPV testing authority.

### CONCLUSION

So, clearly, there is a compelling case in favour of the use of PPV. This is particularly so following the introduction of the latest equipment that overcomes all of the earlier concerns and today's greater understanding of the need for training and fire scene control and communication.

This appears to be a view shared by many firefighting professionals. In a recent survey of brigades in the UK, all seemed to agree that PPV is the most effective method of ventilation, and this view was also held by brigades that do not have the equipment. Undoubtedly though, all would also confirm that the key to its successful use is to consider at all times that PPV is part of a well organised and coordinated fire ground operation.



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# COMMENTARY ON THE FRENCH ROAD TUNNEL FIRE IN JUNE 2005

ON SATURDAY 4TH JUNE there was a fire in the Frejus Tunnel, a road tunnel linking France with Italy, in which two persons died. The author has no information on the fire other than that reported by the news agencies but will make such comments as he can for the benefit of readers. It is clear from the reports that the fire began in a truck carrying tyres so to look at tyre combustion will be a good start.

Tyres have a calorific value in the region of  $30 \text{ MJ kg}^{-1}$ , the value expected for a quality coal when dry. Tyres contain materials additional to the primary constituent rubber, notably carbon black. The combustion of tyres is of interest in areas other than fire protection, partly because so many worn-out ones – tens of millions a year in the UK – have to be disposed of, and incineration is one option. As so often happens with combustible wastes there have been successful attempts to obtain some benefit from the heat released on burning and there is significant interest in TDF – tyre-derived fuels – on the world energy scene. The UK Company Elm Energy and Recycling produces 25 MW of

electricity for sale to the grid using steam in a Rankine cycle with waste tyre material as the fuel. There is similar activity in the US at places including Bay Front, Wisconsin.

When tyres are burnt intentionally a large proportion of excess air is necessary, otherwise there will be very smoky combustion. This is because tyres when hot undergo thermal decomposition (pyrolysis) reactions which produce solid carbon particles and oily vapours. Excess air is necessary to ensure that all such products go on to burn, forming carbon dioxide and water vapour. Whilst the incinerator operator or the TDF user can control the air supply, there was of course no such control possible during the accidental burning of the cargo of tyres in the French road tunnel fire. There, the only air supply would have been that from the atmosphere diffusing into the fire and we can confidently conclude that the burning would have been very dirty indeed. This is in any case confirmed by the news reports where the term 'heavy smoke' is used.

One of the persons who died in the fire had abandoned his own vehicle and run about half a mile through the smoke, intending to escape from the tunnel, before collapsing. The current *Handbook* of the Society of Fire Protection Engineers considers smoke

*A good deal of semi-quantitative information on the effect of smoke on persons exists and a more precise comparison than that made here will almost certainly feature in the formal follow-up.*

effects on the occupants of an aircraft cabin filled with smoke from jet fuel which has burnt under oxygen-limited conditions. In such circumstances incapacitation through asphyxiation of an individual in the cabin is expected after two to three minutes. There is broad consistency between this and the fate of the fugitive from the fire in the French road tunnel. A good deal of semi-quantitative information on the effect of smoke on persons exists and a more precise comparison than that made here will almost certainly feature in the formal follow-up.

*When tyres are burnt intentionally a large proportion of excess air is necessary, otherwise there will be very smoky combustion.*

**By J.C. Jones**

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# Understanding NFPA 1991 and why it is Important to the Fire Service and Industry

By Jeffrey O. Stull

*Pic courtesy of Trelleborg Protective Products*

IN THE EARLY 1980S when many communities were in the process of setting up their own hazardous materials response teams, one particular incident in Benicia, California became a pivotal event driving the development of standards on chemical protective clothing for emergency response.

Firefighters responding to a railcar spill of dimethylamine wore what they believed to be the correct totally encapsulating suit, made of butyl rubber with neoprene gloves and polycarbonate faceshields. However, in responding to the spill, one team member's faceshield crazed and split open exposing the responder to the toxic chemical. While there were no long-term effects to the responders, the incident was considered serious enough to warrant an investigation by the National Transportation Safety Board. The National Transportation Safety Board concluded that incorrect protective suits were selected because the faceshield was not compatible with dimethylamine (though appropriate for butyl rubber) and recommended that the government and private industry pursue standards on chemical protective clothing for emergency response.

In about the same time period, Memphis firefighters responding to an

ammonia leak at a refrigeration plant opted not to wear their optional "flash" covers that were provided with their butyl chemical protective suits. Unfortunately, an unknown ignition source lit off the leaking ammonia causing a fireball within the closed space. One firefighter died while the other was seriously injured. Many believed that if the firefighters had been wearing their aluminized overcovers, neither would have been affected.

Other serious accidents have occurred over the years and while the experience of both municipal and industrial hazardous materials teams has grown considerably, the effectiveness of providing adequate protection to the responder has been most affected by promulgation of National Fire Protection Association (NFPA) standards on emergency chemical protective clothing. The NFPA began its efforts to develop comprehensive performance standards on chemical protective

clothing in 1985, primarily in response to the NTSB recommendation. A new NFPA subcommittee on this subject worked for six years until the first standards were released in 1991. During the development of the standard, the subcommittee had several issues to consider, including:

- Testing of all materials, seams, and components for chemical resistance, not just the garment material that had been industry practice;
- Identification of a common battery of chemicals for requiring manufacturer testing;
- The need for physical protection from rough surfaces, jagged edges, and other hazards at the response site;
- A mandatory requirement for suit/material flame resistance; and
- Multiple uses of chemical protective suits.

The subcommittee chose to establish two levels of protection – vapor protection and liquid splash protection. These two levels became embodied in two different standards with correspondence to the EPA levels as shown on the next page.



Definitions of Protective Clothing Types by Performance Tests in NFPA Standards

Type of Clothing	Corresponds to	Material Performance*	Overall Clothing Performance*
Vapor protective (NFPA 1991)	EPA Level A	Permeation resistance	Gas-tight integrity
Liquid-splash protective (NFPA 1992)	EPA Level B	Penetration resistance	Liquid-tight integrity

\* See explanations of material and overall clothing performance tests

Using this hierarchy, the NFPA attempted to define protective clothing types on the basis of needed performance as demonstrated by test methods designed to measure the type of protection provided. This scheme associated clothing gas-tight integrity and material permeation resistance with vapor protection and clothing liquid-tight integrity and material penetration resistance with liquid splash protection. These performance-based definitions were intended to replace the historical EPA levels of protection that define what clothing should look like but not how it should perform.

In addition to defining a performance hierarchy among different types of chemical protective clothing, the NFPA standards defined uniform requirements for chemical resistance and limited flame resistance for ensuring a consistent level of performance

for all parts of the clothing ensemble. These decisions were paramount in creation of the two NFPA standards since they established an elevated requirement for performance compared to the then industry practices.

Chemical resistance testing requirements were based on the manufacturer demonstrating performance against a battery of chemicals – 21 different chemicals in the case of NFPA 1991 and 7 different chemicals for NFPA 1992. The requirements extended to all parts of the chemical protective suits, including the garment, visor, glove, and footwear materials in addition to seams. Furthermore, because of potential material breakdown that could occur during use, chemical resistance testing (permeation for NFPA 1991 and penetration for NFPA 1992), these tests are required to be conducted on material samples that first had been

subjected to abrasion and repeated flexing, as might occur in use. These requirements raised the bar significantly in the chemical protective clothing industry.

The inclusion of a flame resistance requirement was a debated area. Ultimately, the NFPA decided to require that all parts of the chemical protective suit be flame resistant. End users on the NFPA subcommittee did not want the “suit wearer to become walking torches” in an accidental flash fire situation. In other words, the subcommittee reasoned that the suit itself should not contribute to the wearer’s hazards. This decision was significant because at the

time, all suits used either rubber or plastic materials. Many of these would readily ignite or melt when exposed to high heat or flame.

At the time the new NFPA standards first appeared in 1991 (the number of the standard is not related to the year of its introduction), there were no products that could meet all of the requirements without some changes. Nearly all manufacturers had to improve seam construction to meet the seam chemical resistance requirements and carefully consider combinations of gloves and footwear to meet different chemical, physical, and flame resistance requirements. However, the fundamental challenge lay in providing a suit material which could demonstrate broad chemical resistance to the battery of chemicals, be physical durable, and also resist ignition when contacted by flame.

Manufacturers approached this challenge with two different approaches:

1. Manufacturers of plastic-based material suits decided to use an outer flame resistant suit. This suit not only provided flame resistance but also protected the vulnerable plastic-based material from abrasion and other physical hazards, which are required in testing. The suit-in-suit concept took the form of an aluminized suit over the plastic suit to conform to the new requirements of the NFPA standards. The aluminized overcover became a popular idea because it connoted flash fire protection, even though it was also required to meet the abrasion resistance requirement in the standard.
2. Other manufacturers developed improvements of their current durable materials to meet all performance requirements. This approach meant that the single layer material suit met the requirements in the NFPA standards, including the difficult abrasion and flame resistance tests.

These approaches have created two separate classes of chemical protective suits that meet NFPA requirements. Plastic-based suits tend to be characterized as single or limited use products, while the single-layer suits are generally



Pic courtesy of Trelleborg Protective Products

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*Pic courtesy of Trelleborg Protective Products*

more robust (durable) and are considered reusable. Unfortunately, many end users and some distributors of these products tend to misunderstand or misrepresent the two classes of products. The plastic-based suits are only compliant with NFPA 1991 when both outer cover and inner suit are worn together. The NFPA subcommittee never intended that the outer cover be considered an option (in the same way that was perceived for the Memphis firefighters). Yet there are several organizations that consider this practice as acceptable even though it voids the certification of the clothing ensemble. For the class of suits requiring the overcover to meet NFPA standards, the overcover must be in place at all times when the suit is used.

There is no doubt that the NFPA standards have created a more protective ensemble for emergency responders. These standards have now been revised three times since their initial release in 1991 (new editions were promulgated in 1994, 2000 and earlier this year), with each revision adding new requirements and improvements to the protection offered. Consequently, the use of NFPA-compliant standards is intended to provide the minimum level of protection for emergency responders and accounts for the broad range of hazards that emergency responders may encounter.

Future articles in this series will address other details related to the NFPA standards and the differences between products in the marketplace.

#### PERFORMANCE TESTS IN NFPA STANDARDS

The key distinction between NFPA 1991 and 1992 are tests for material chemical resistance and overall clothing

integrity. NFPA 1991 requires that materials meet a permeation resistance test. In this test, chemical is placed on one side of a material sample in a test cell, while the other side of the material contains a "collection medium" that is periodically sampled and analyzed for chemical that passes through (permeates) the material. The time required for chemical to permeate is reported as the breakthrough time. NFPA 1991 requires that breakthrough times must be greater than 1 hour with continuous exposure to the chemical. NFPA 1991



*Pic courtesy of Trelleborg Protective Products*

also requires permeation testing against 15 different representative liquids and 6 different gases. The 2005 edition also includes chemical warfare agents and additional toxic industrial chemicals of concern in terrorism attacks. In comparison, NFPA 1992 uses a penetration test. Like the permeation test, a material sample is placed in a test cell with test chemical on one side. However, the penetration test involves a test operator looking at the opposite side of the material for liquid chemical coming through the material. NFPA 1992 penetration testing is conducted against 7 different liquid chemicals. The requirement in NFPA 1992 is that no chemical can be seen to penetrate the material within the one-hour test period. However, because chemicals can still permeate through materials at a molecular level, garments meeting NFPA 1992 are only for splash protection and should not be used in situations where contact with skin toxic or carcinogenic chemical is expected.

Integrity tests effectively evaluate how well suits prevent entry of chemicals through any part of the suit. In NFPA 1991, suits are inflated and are required to hold pressure (after the exhaust valves have been blocked) as a demonstration of gas-tight integrity. This same type of test is used in the field to evaluate if suits are still viable for use. Since NFPA 1992 suits are used for splash protection, a liquid-based shower test is used to determine if liquids will penetrate through openings or interfaces in the suit. In the shower test, the suit is placed on a manikin this is sprayed with surfactant-treated water from several different directions. The interior of the suit is then examined for liquid leakage. NFPA 1992 requires that no liquid be found inside the suit or on the manikin.

Both NFPA 1991 and 1992 have other requirements for material physical hazard resistance, durability, flame resistance, and component performance. Performance tests are used instead of design specifications to allow manufacturers latitude in how they design and develop chemical protective clothing.



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Tankmaster™ passes the stringent LAST-FIRE test with flying colours. This is the oil industry's own foam test that simulates real-life storage tank fire fighting conditions.

### Equipment compatible

Tankmaster™ is ideal for use with large-capacity aspirating "Colossus" type monitors, large-capacity semi-aspirating (also called non-aspirating) monitors, and fixed foam system pouring nozzles. It passes LASTFIRE tests in all three categories. In addition, it has a comprehensive set of Underwriters Laboratories Listings for use with storage tank fixed foam equipment.

### MTBE

Tankmaster™ is UL Listed not only on hydrocarbon fuel, but also on the gasoline additive methyl tertiary butyl ether (MTBE) and blends of MTBE and gasoline.

### Goes the distance

Tankmaster™ produces a stable and long-lasting foam blanket that travels long

distances over burning liquid surfaces. This is important since the average diameter of a tank is 60 to 75 metres, with the largest being around 110 metres.

### Resists intense heat

Tankmaster™ has a protein-based "skeletal" structure inside its bubble walls that provides exceptional resistance to heat, enabling it to pass through flames and impact on hot fuel.

### Seals against hot edges

Tankmaster™ has bubble walls that are tough enough to overcome high fuel vapour pressures around the periphery of the burning fuel and seal tightly against even the hottest "cherry red" tank shells and obstructions.

### Resists fuel pick-up

The detergent-free formulation of Tankmaster™ makes its bubbles inherently fuel repellent, enabling it to tolerate even the most vigorous mixing with hydrocarbon fuel when applied "over the top" from ground-based monitors. This is crucial in minimising the risk of flashback.

### Suppresses vapours

Tankmaster™ prevents ghosting and flashover by forming a tough cohesive foam blanket that stops flammable vapours from percolating through the bubbles.

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# CHINA COAL MINE FIRES

MORE THAN 40 WORKERS were killed as a result of an accident in a coal mine in China on 3rd August this year and such accidents are happening with very disturbing frequency in China at present. Altogether 6000 Chinese miners were killed at work in 2004. A little background on the coal industry internationally will be a useful lead-in to this commentary.

Our own country the UK is no longer a major player on the world coal scene, now producing only 35-40 million tonne of hard coal per annum compared, for example, to the US which produces in excess of 800 million tonne and Indonesia which produces about 100 million tonne. Other countries producing hard coal in quantities in excess of 100 million tonne per annum include Australia, South Africa and the former Soviet Union. Yet 80 years ago the UK production was three quarters the US production which, taking account of the differences in population and land mass, means that the UK production was prodigious. At least in the UK the coal industry continues to the present time, on a much reduced scale: in Belgium the coal mining industry, which once had an output comparable to that of Canada, 'closed shop' altogether in 1992.

It has long been recognised that China is one of the most coal rich countries in the world and her current production is 1326 million tonne per year. Even so, China imports much coal and the same is true in relation to her oil reserves: there are large reserves of oil in China, but the country has been

a net importer of oil since the early 'nineties and she continues to provide for further imports by investing in new pipeline structures to bring oil into the country. Fuel supply and demand is highly complex and full of anomalies and the author is unwilling to make a direct correlation between the facts recounted above and the competence or otherwise of those in management and policymaking roles on the China fuels scene. This is partly because he is aware of several very promising enterprises on the part of the Chinese oil company Sinopec, both within China and elsewhere.

That standards of safety in coal mining in China are open to strong criticism is however irrefutable, nor does it represent merely a recent slip in standards. The worst coal mining accident on record occurred in Honkeiko, China in 1942 when 1549 lives were lost through explosions in the mine. To set that in context, in 20th Century Britain there were only three coal mining accidents in which the death toll exceeded 100.

The primary explosion hazard in a mine is of course coal-bed methane, known to miners as firedamp. Methane is much less dense than air and so

tends to rise to the ceiling of an enclosure within a mine where there has been leakage. This is advantageous from the safety point of view, and in earlier generations there were mine employees whose job it was to enter the mine before a shift began in order to ignite, from a safe distance, methane which had accumulated that way during the previous shift. The other explosion hazard in mines is coal dust. It appears that at in the Honkeiko accident coal dust had become suspended in firedamp, a lethal combination indeed. Where death is not due to the direct effect of an explosion, with its heat and overpressure, it can be due to inhalation of carbon monoxide, known in the mining industry as afterdamp, which is a product of any explosion which might have occurred and is highly poisonous.

All of this we can broadly relate to what we know of the catalogue of mining disasters in China recently. China has not raised, or even monitored, the safety of coal mining over the decades but is needing more and more coal now to provide energy for the developments in which the country is engaging. We conclude by returning to our comparison of coal usage and that of oil. There are no 'developments' which do not have associated energy costs and the consequent buying up of huge amounts of crude oil by China has been a factor in trends of oil prices in recent months. As things stand, any redressing of this situation by using domestic coal instead of imported oil to 'develop' China must be deprecated in the strongest terms. Domestic oil, maybe!

*That standards of safety in coal mining in China are open to strong criticism is however irrefutable, nor does it represent merely a recent slip in standards.*

**By J.C. Jones**

Department of Engineering  
University of Aberdeen  
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# Industrial Vehicles

## ALBERT ZIEGLER AIRPORT CRASH TENDER

in compliance with ICAO, ADV,  
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M.A.N. chassis 36.1000 VFAEG 8x8

M.A.N. V 12-cylinder diesel engine with  
735 kW/1,000 PS, EURO 2.

RENK 5-speed automatic transmission  
with retarder and mechanical emergency  
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Progressive coil spring suspension.

EG brake system with ABS.

Single tires 16.00 R 20 Michelin XZL.

Max. speed 138 km/h.

Acceleration approx. 25 s from 0-80  
km/h.

GVW 40 t.



Stuttgart Airport, Germany

## ZIEGLER ALPAS large cab for a crew of 1+2 or 1+3

Excellent viewing angle for driver and in  
extinguishing actions through the large  
windows.

Fold-down treadboards ensure optimum  
entry to the cab.

All seats are air-cushioned, have head-  
rests and integrated 3-point safety belts.  
Co-drivers' seats with integrated BA  
brackets.

## ZIEGLER ALPAS superstructure

Modular construction, resulting in easy  
access for service and repair. Large  
maintenance flaps.

ZIEGLER AZ roller shutters, fold-down  
treadboard in the rear.

The rugged ZIEGLER aluminium panel  
system (ALPAS) with screwed light-  
weight profiles is used for all  
superstructure moduls.

The connection of the aluminium ele-  
ments is via drop forging, resulting in  
an exceptional bending and torsion  
resistance.

## ZIEGLER extinguishing agent tanks

GRP-tanks.

Water/foam contents from 11,000 l up  
to 15,000 l (depending on GVW).

1 or 2 foam tanks as requested.

Optional: Outside contents indicator for  
water tank.

## ZIEGLER pump unit

With separate M.A.N. engine, thus

completely independant of the vehicle  
engine.

Pump performance from 6,000 l/min up  
to 10,000 l/min.

Optional with high pressure part 300  
l/min at 40 bar.

Double piston priming system  
TROKOMAT PLUS.

Automatic flow controlled pump pro-  
portioner MAD/EAD with proportioning  
rates adjustable by remote control.

Automatic pressure control TOURMAT  
D.

Self-protection unit (7 nozzles), perfor-  
mance approx. 400 l/min.

Rapid intervention unit water/foam with  
GRP reels, swivelling range 90°.

## Bumper monitor, electrically remote controlled

With a performance of 1,000 l/min up  
to 3,800 l/min, electronic joy-stick  
control.

Nozzle or combination pipe version as  
requested.

Throw 40 up to 65 m.

For water/foam or with hydro-chem  
technology for water/foam/DC.

Elektrohydraulically raisable and sinkable  
RHINO bumper monitor.

## Roof monitor

With a performance of 5,000 l/min up  
to 6,000 l/min.

Electronic joy-stick proportional control.

Nozzle or combination pipe version as  
requested.

Manual emergency control via hand  
wheels.

Throw 75 up to 90 m.

For water/foam or with hydro-chem  
technology for water/foam/DC.

## Operation and control

Electronic control of the extinguishing  
unit via PLC with CAN-Bus networking.

Ergonomically designed control panels  
with displays in driver's cab and in the  
pump bay.

1 or 2 control panels for operation by  
driver and/or co-driver as requested.

The high automation ensures a safe and  
faultless operation also in extreme  
situations.

Integrated diagnostic system and remote  
diagnosis via modem.

## Options

- CRASH RESCUE elevated extendable  
extinguishing arm SNOZZLE, height  
of reach approx. 15 m, swivelling  
range to the left and right 30°. Nozzles for extinguishing arm up to  
4,800 l/min.
- Piercing nozzle with 1,000 l/min.
- Combined water/foam/DC nozzles for  
all monitors and extinguishing arm.
- DC extinguishing units from 250 kg  
up to 1,000 kg, low or high pressure  
units as requested.
- CO<sub>2</sub> extinguishing units from 60 kg



up to 360 kg with rapid intervention units.

- Outside starting unit with up to 20 different functions.
- Lighting system for the surroundings with fluorescent strip lamps.
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- Backing video and/or infrared camera.
- Airconditioned driver's cab, auxiliary heating etc.
- Light-mast with generator.
- Holders and brackets for equipment in compliance with ADV and ICAO.

## ROSENBAUER INTERNATIONAL AG

### AIRPORT RESCUE AND FIRE-FIGHTING VEHICLE PANTHER 6x6 CA5 – ARFFV 12000/1500/135

ROSENBAUER Motors CFR 6x6  
Newcastle Airport, UK  
ROSENBAUER International AG

#### CHASSIS

Type: ROSENBAUER Motors CFR 6x6  
Engine type: Caterpillar 4-stroke diesel engine, in line with EURO 3  
Engine output: 705 HP at 2100 min<sup>-1</sup>  
Gearbox: Twin Disc TD61-1180, 6-speed automatic

#### CAB

Cab design: ROSENBAUER Aluminium-Konstruktion fix aufgebaut, bestehend aus: Aluminium-Formrohrgerippe mit Aluminium-Verblechung und Alu-Dachkantenprofil, Stahl-Stoßstange, großflächige Verglasung, Glas-Drehüren  
Crew: 1 + 3  
SCBA fittings: 4, integrated into the seats

#### SUPERSTRUCTURE

Self-supporting ROSENBAUER laser-cut aluminium panelling in bonding/bolting design, with glass fibre reinforced polyester add-ons



Panther 6x6 CA5



Panther 6x6 CA5

#### EXTINGUISHING AGENTS

Water tank capacity/material: 12,000 l/ polypropylene

Foam tank capacity/material: 1,500 l/ polypropylene, integrated into the water tank

Powder unit: 135 kg

#### PUMP UNIT

Type/location: ROSENBAUER R600 normal pressure pump, midships

Drive: Power Divider

Pump output NP: 7,000 l/min

Foam admixing system: automatic ROSENBAUER FOAMATIC RVMA 500 NP admixing system

Admixing rate: 3, 6 and 8%

#### FRONT MONITOR

Type/operation: NEW FEATURE! ROSENBAUER RM12E water/AFFF monitor with electrical remote control via a joystick

Output: 1,200 l/min

Fixtures: infinitely adjustable, electrical straight jet/spray setting

#### ROOF MONITOR

Type/operation: NEW FEATURE! ROSENBAUER RM60E water/foam monitor with electronic remote control via a pistol grip

Output: 5,000 l/min

Throw: approx. 90 m

Features: searchlight, 50% partial quantity setting, foam barrel

#### QUICK ATTACK HANDLINE

Type: 1 ROSENBAUER water/foam reel

Hose type: non-collapsible rubber hose

Hose length/DN: 50 m/32 mm

Branch pipe design: ROSENBAUER RB 101

#### QUICK ATTACK HANDLINE

Type: 1 ROSENBAUER powder reel

Hose type: non-collapsible rubber hose

Hose length: 40 m/32 mm

Branch pipe design: 5 kg/sec powder pistol

#### SELF-PROTECTION SYSTEM

5 ground sweep nozzles

#### SPECIAL FEATURES

- 24V inboard voltage
- Engine with Euro 3 accreditation
- Air-conditioning
- Right-hand drive
- Differential locks
- 2 pressure-reduced outlets
- 35 kg BCF unit with lowering device
- 2 ladder lowering devices
- Design painting

#### TECHNICAL DATA

Operating weight: approx. 31,000 kg

L x B x H: 11.84 x 3.0 x 3.5 m

Max. operational speed: 120 kph

Acceleration: from 0-80 kph in 32 sec

## SIDES

### Industry Range

Oil, gas and chemical industries use highly flammable products in large quantities. The VMR series vehicles are designed to have a very important fire fighting capability thanks to high output pumps, mixing systems and monitors. Several different agents can be used either separately or simultaneously on a vehicle: water, foam, dry powder.

The VMR 40 BE vehicle gives an easy reach to the top surface of high rise tanks.

### FOAM VEHICLE FOR REFINERY TYPE VMR 140 SPECIFIC

#### Cab-Chassis

MERCEDES



SIDES VMR 140

**TANK****Foam compound capacity**

14,000 l

**Water pump**

SIDES type FP 10000

**Output/Pressure**8,300 l/min<sup>-10</sup> bar**Proportioning system automatic by injection**

SIDES type I.D.A.600

**Pressure Regulation**

Hydraulic by RPU 200

**FIRE-FIGHTING EQUIPMENT****Foam monitor**

SIDES type CM 50/80 IF assisted

**Output**

5,600 to 8,000 l/min

**Range**

90 to 120 m (depending on output)

**Portable foam branch pipe**

SIDES type LMP 500 (Qty: 2)

**Output**

450 l/min

**Range**

30 m

**SK FIRE INDUSTRIAL FIRE FIGHTER**

Currently in operation with the Ministry of Defence in Brunei, this unit is one of a series of similar appliances that protect military installations in the Sultanate.

Based on a Volvo FM9 6x4, with a

320 hp engine, 6 speed automatic transmission and a 4 door, fully tilting crew cab providing seating for eight persons (driver plus seven) and 'quick don' SCBA brackets for the 4 forward facing seated crew in the rear crew cab compartment.

The coach built superstructure comprises three full vehicle width separate modules contoured to the cab and mounted such as to provide maximum flexibility for chassis movements. The centre module comprises a formed integrated 7,000 litre/1,000 litre water and foam tank fabricated in stainless steel.

Front and rear modules are fabricated in stainless steel frame work with aluminium panelling with all three modules top decking in heavy gauge positive grip aluminium tread plates and perimeter low safety railings. Access to the decking is by two recessed boarding ladders at the rear of the appliance.

The rear module houses a UL Listed, Rosenbauer NH40 multi-pressure water pump rated at 4,000 litre/minute at 10 bar normal pressure (NP) and 400 litre/minute at 40 bar high pressure (HP) with four normal pressure delivery outlets.

The pump incorporates a Rosenbauer Fix Mix integral automatic RTP (round-the-pump) foam proportioning system for both NP and HP, independent of pump pressure and/or discharge rates. Foam concentrate percentages can be set at 3% and 6% for NP and 3% for HP.

A top deck mounted Rosenbauer RM25 aspirated water/foam monitor is remote controlled by a single hand operated 'joy stick' from inside the driver's cab.

The rear and front modules are each fitted with 2 large lockers, one on each side, enclosed by anodized aluminium roller shutters. The rear lockers each enclose a high pressure hose reel 54 m of 19 mm smooth bore hose terminating in trigger controlled jet/fog/spray branch guns.

The front lockers provide stowage for delivery hoses, branch pipes, aluminised suits, additional SCBA's, etc.



SK Fire Industrial Fire Fighter



## THE NEW CROMWELL DUAL HELMET SYSTEM



*The Cromwell ER1 Emergency and Rescue Helmet*

Today's operational demands on the Fire and Rescue Services have changed dramatically since the days of the cork fire helmet, giving the need to provide increased levels of protection for personnel involved in fire and rescue operations.

It is generally accepted that less than a third of all 'call outs' to the Fire and Rescue Services require the need for a structural fire fighting helmet. Other incidents not requiring this type of helmet include road traffic accidents, woodland fire fighting, water rescue, urban search and rescue and industrial incidents such as confined space rescue operations.

To meet these requirements Helmet Integrated Systems Ltd. (HISL) has developed its new Cromwell dual helmet system featuring two helmet shells that can be integrated into one.

The base helmet – the Cromwell ER1 – is for Level 1 emergency and rescue operations that do not require a structural fire-fighting helmet.

The ER1 can also be used by paramedic, water rescue and civil defence personnel and is fitted with an internal

goggle and a connection for optional ear defenders. In addition the helmet can be configured for specialized operations such as heli-deck, coastguard, air sea rescue and public security.

The Cromwell FR2 with an integral full face shield, has an internal clip arrangement enabling it to be fitted to the ER1 in seconds, providing additional heat, flame and impact protection to the wearer when undertaking structural fire fighting operations.

The design of the modular internal connection for the two helmet shells ensures that there are no connections on the outside of the helmet that are susceptible to potential impact damage, or heat load.

The FR2 can also be fitted with integral communications, neck capes and SCABA facemask fixing points.

The Cromwell helmet is manufactured using the latest moulding techniques and materials and has been developed to meet the requirements of the planned UK Fire Services Integrated Clothing Project (ICP).

The new helmet is also designed with



*The FR2 fits easily and quickly over the ER1 when structural fire fighting protection is required*

reference to published international anthropometrical data relating to both male and female fire fighters, and rescue personnel, across a range of ethnic groups, ensuring that the helmet will be suitable for international use.



*The Cromwell FR2 Structural Fire Fighting Helmet*

HISL, the Hertfordshire UK based, ISO 9001 approved manufacturer of the new Cromwell, supplies most of the UK Fire Services with its Cromwell F500 and F600 fire helmets and is the leading international supplier of aircrew helmets for military and commercial aircraft.

HISL is able to offer sample helmets for evaluation and trial to interested fire and emergency service users.

For more information contact:

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Partner offers two powerful and reliable rescue cutters: The Partner K950 Rescue and the K650 Rescue. The Partner K950 Rescue is our largest rescue cutter and has a higher power-to-weight ratio than any other rescue cutter on the market.

The Partner K650 Rescue is a smaller and lighter machine that fits in most types of rescue vehicles.

Easy start and the specially designed starter handle with room for heavy gloves make our cutters really easy to start. Reliability is increased considerably, since the Active Air Filtration System is protected inside the casing and the cutting arm has a sealed drive belt. The chromium plated blade guard, which is visible in smoke, steam and water spray, makes operations much easier to control.



## **PARTNER K950/K650 RESCUE**

Engine	Air-cooled 2-cycle engine
Displacement	94 cc/71 cc
Power	4,5 kW/3,5 kW
Weight, without fuel and blade	10,4 kg/9,1 kg

### *Cutting equipment, blade:*

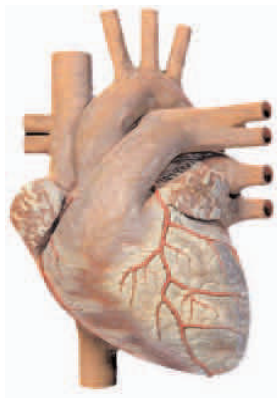
Diameter	350 mm (14")/300 mm (12")
Cutting depth	125 mm (5")/100 mm (4")

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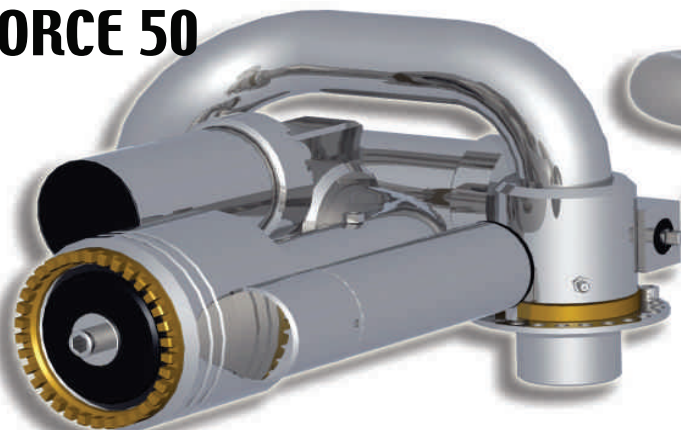
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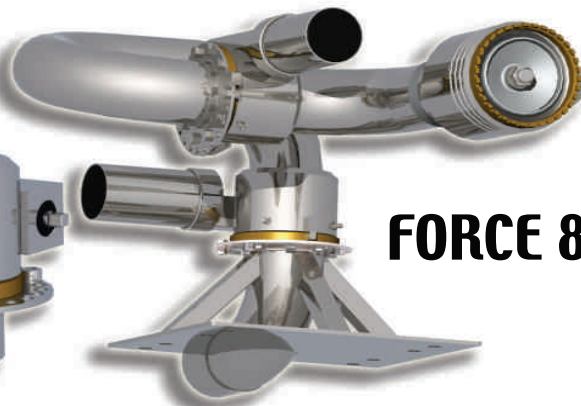
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# Seal Fires

By Dave Cochran

Angus Colossus large-capacity aspirating monitor in action on hydrocarbon storage tank fire in Middle East

MUCH HAS BEEN WRITTEN about fires that occur in storage tanks containing Hydrocarbons. Seal fires, while they are probably the easiest to handle – where hydrocarbons and tank fires are concerned – there is still some danger involved. Fires of this type will only occur with floating roofs, or those that move up and down with the product and have no vapor space to contend with. This will be discussed later. This would also include fires that involve crude oil products. It should also be mentioned here that there is no concern of a boilover with seal fire situations.

One of the dangers is attempting to handle these fires while walking the wind girder. This is a major safety item. The girder is approximately 3 feet in width, with a spill barrier that is about 6-8 inches high. While this is sometime used as a platform for maintenance as well as for seal fire combat, it acts as a platform for accidents to happen. The prime purpose of the wind girder is to maintain the walls in a good firm upright position, and keep them from damaging the seal and roof through movement caused by winds. It is very obvious this is not a good way to combat these fires simply because the safety factor is minimal. This is especially true in inclement weather. Snow, ice, rain all make working from this platform a very unsafe condition. IF this is the method chosen, the firefighter(s) should be tied off to prevent them from falling to the ground. If the wind girder had a hand rail around the circumference, then it would offer a good safe working platform. I have heard of but not seen, a device consisting of a

rolling wheel that is attached to the rim of the vessel that will roll along with the firefighter and prevent the fall that, if not fatal, will certainly cause serious harm to the body. It is recommended other methods be considered. These will be discussed later.

Most of these fires occur during lightning and or heavy rain storms. Depending on the amount of rain, the ability of the roof drains to handle the drainage, will dictate the amount of water on the roof. This water, if the

volume is heavy creates a problem when water created by the firefighting efforts may become deep enough to sink the roof. Obviously if firefighters are on the platform or the wind girder, and the roof sinks, they are in serious danger and will very likely be seriously burned, if not fatally, and will be blown to the ground by the sudden flash of a full surface fire. There is little chance of a safe exit if this occurs.

The biggest danger created in seal fire combat is a low roof which may create a vapor space between the roof and the product level. When firefighters arrive on a seal fire scene, and the burn line is low, it is imperative they ascertain the product level in conjunction with the roof. IF the possibility of a vapor space exists, NO ONE should be allowed to climb the stairs to the top of the tank until it is certain there is no vapor space, or a possibility of a vapor

*If a vapor space exists it should be firm in the minds of every one involved any introduction of air into the vapor space may create the correct vapor air mixture to cause an explosion to occur under the roof.*



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*Application of finished foam from the ground should never be attempted if the roof is floating simply because the roof may sink thus creating a full surface fire situation.*

space occurring during fire combat. If a vapor space exists it should be firm in the minds of every one involved any introduction of air into the vapor space may create the correct vapor air mixture to cause an explosion to occur under the roof. Obviously the roof may blow clear of the tank, causing another serious situation to occur. This could create another fire situation, as well as danger to anyone in the vicinity of the fire scene. Once the roof is floated, then a plan of action can be made and extinguishment efforts can begin. If there is sufficient water available, the walls of the tank should be cooled – as long as it can be cooled completely around the circumference of tank. This prevents sagging of the walls and will maintain their integrity.

When finished foam is applied to a fire, air is also being applied. Depending on the amount of expansion of the foam will dictate the amount of air being applied. The same goes with the application of water some air is being applied as well. IF foam is being applied with a low roof to the seal area, air is being inducted into the vapor space, and a possible explosive condition may be created. Finished foam should never be applied when this condition exists – **ESPECIALLY FROM THE TOP OF THE STAIRS OR WIND GIRDER.**

IF it is not possible to apply foam from the ground, then other methods which are discussed below should be utilized. Application of finished foam from the ground should never be attempted if the roof is floating simply because the roof may sink thus creating a full surface fire situation. One you don't want to occur. In addition, it is not recommended to use aerial devices to combat seal fires especially if the roof is floating because it is possible to sink the roof if too much water is applied.

There is a device available today that can be attached to the rim of storage tanks which also contains a monitor to which a nozzle of various flows can be attached. This works very well and can be utilized if no vapor space exists. A precaution is necessary in that water can be shot onto the roof if care is not exercised, which could, depending on the water depth already on the roof, create a problem with sinking of the roof.

Foam application devices can be fabricated on site by fitting 1½" or 2" inch pipe together into a partial "U" shape with a slight bend on the short side-which should be inserted

over the top of the tank. The slight bend should bring the foam discharge against the wall of the tank for a gentle application. Several holes should be drilled near the end of the short side to cause for some expansion of the finished foam. On the long side, or the side on which the hose line is to be attached, an hose connection should be attached for application of the water foam solution. These devices are called wands and must be placed onto the tank with cherry pickers, cranes, ladder towers, ladder trucks or other such devices that can reach the rim of the tank. When fabricating the device, make certain they will reach over the width of the wind girder, and, drill a hole in the top of the lateral run of pipe-especially if being used on internal floating roof tanks. If foam towers are available from nearby refinery or chemical plants, they can be utilized to make extinguishment. These are very good devices for such fire situations, but are very cumbersome and require some expertise to assemble and elevate. Elevation of the device is done hydraulically by water being applied through the hydraulic chamber, and guy wires (3) are required to maintain a good vertical raise. Unfortunately these devices are no longer available in the market place.

If the involved tanks is down for maintenance, is already blinded off, but still closed, it should be taken under strong consideration to pull the product blind – which should be installed between the flange and the tank – as long as it can be done safely – to initiate filling of product for floatation of the roof. This will take some time, but will be the best method for firefighters to make a successful and safe extinguishment. Safety is paramount regardless of the situation. Once product is introduced, it should be done slowly at first until the product is well above the inlet of the pipe. A very definite increase in the fire will also be noticed because of the increase in vaporization of the product.

While this is being accomplished the fire teams will have plenty of time to prepare for a safe and successful extinguishment. The team that is to make the extinguishment should have a meeting so that all are fully aware of

the events that are to take place, all know who is to do what, where and when. This includes pump operators, and anyone else that may be involved.

Foam should be proportioned from the ground as opposed to from the platform. It should also be remembered the height of the vessel will dictate how the foam is to be proportioned. Back pressure to the eductor will shut everything down. If around the pump devices or foam pumpers are available they should be utilized. A 150 foot diameter storage tank seal fire will, depending on the foam dam, have a square footage of approximately 930 feet. The NFPA 11

minimum application density is .3 gallons per foot which equates to a solution rate of 279 gpm. A minimum of 20 minutes is required to make a successful extinguishment.

The minimum concentrate is 180 gallons, and minimum water for extinguishment is 5,420 gallons at 271 gpm. This does not include cooling water, foam concentrate or water that may be required for post fire security. If you are using a 1% concentrate the minimum flow is 2.79 gpm or a minimum of 55.8 gallons.

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Lenzing FR® keeps the body dry and cool. Heat stress and heat stroke can be avoided.

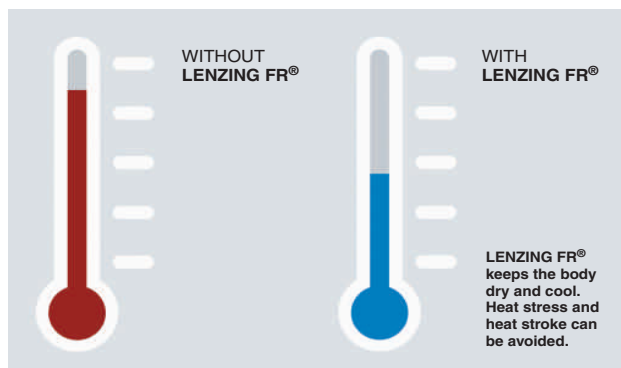
### Permanent protection from heat

Lenzing FR® offers protection from all kinds of heat: fire, radiant heat, electric arcs, molten metals and flash fires. The most important goal of protective clothing is to prevent the skin from burns. After all, the skin is the body's largest and most sensitive organ. From a technical point of view, Lenzing FR® is a work of art. The fiber, which is made of a natural raw material, has a flame retardant substance incorporated throughout the cross section of the fiber. As well as being ecofriendly, the latter also ensures permanent protection. The protective substance cannot be removed by either washing or abrasion. Flame resistant once, flame resistant forever. . .

### Improved performance and efficiency!

Lenzing FR® does not only offer you safety. It offers you functionality. The performance and efficiency of the wearer improves significantly when the comfort of the protective garment is enhanced. Moisture absorption along with breathability and skin friendliness all have to be a given as all are vital components in flame resistant protective clothing. These properties make it possible for Lenzing FR® to significantly reduce the risk of heat stress and heat stroke. People in professions involving a high level of risk from burns need to wear special protective clothing. Apart from direct fire, heat, in its different forms, represents a significant danger. Skin is our largest organ and its only form of protection is our clothing. The outcome could be fatal if as little as 15% of

the human skin is destroyed. Lenzing FR®, with its incorporated flame retardant agent, protects the skin from heat like no other flame resistant High Performance Fiber. Lenzing FR® offers anyone in the emergency services excellent protection from 2nd and 3rd degree burns. And it goes one step further since its physiological properties reduce the risk of heat stress and heat stroke and improves the performance and comfort of 100% aramid garments. The TPP values of Lenzing FR® are first rate and it considerably enhances the performance of aramid fibers. The break open behavior of protective clothing is improved following exposure to flames and heat. The skin continues to be protected.



### A comparison gives you the reassurance you need

Thermal insulation barriers are used in firemen's jackets. One common type is comprised of three layers of spunlace fleece (each layer being 80 g/m<sup>2</sup>). The following pictures show a typical result after performing the "TPP"-Test, EN ISO 9151. This test demonstrates that the thermal insulation function is enhanced with a blend of Lenzing FR® and m-aramid fibers.

For special clothing which resists radiant heat, Lenzing FR® fabrics are used in an aluminized form. These offer protection from extreme radiant heat. They also improve the wear comfort and prevent heat stress and heat stroke.

### What causes heat stress and heat stroke?

Mental and physical exertion increases the body's core temperature. Increased blood circulation and the production of perspiration cool the body down. This

cooling down process can be disrupted due to improper heat and moisture management leading to problems with concentration, fatigue, muscle cramps, difficulties in breathing and ultimately heat stroke. The excellent moisture management and breathability of Lenzing FR® lead to a reduction in the risk from this mortal danger.

In blends with other fibers, Lenzing FR® is a cost effective way of improving the comfort and performance of protective clothing. In addition it optimizes the dye affinity, fastness to light and is naturally anti-static. As a result, Lenzing FR® based fabrics are the real "high performers" among the flame resistant fabrics. All over the world, Lenzing FR® based fabrics have achieved the optimum balance of properties in protective apparel.

Underwear and protective hoods made of Lenzing FR® are extremely soft and pleasant to wear. Even in a danger zone, Lenzing FR® provides the optimum climate for the body. Its moisture management and skin friendly properties all mean that the concentration and performance of the workers is enhanced.

### The perfect blend – Lenzing FR® has the power to improve

Functionality depends on the properties of different fibers. Protective clothing made with blends of Lenzing FR® are more comfortable than those using 100% aramid fibers. Aramids, which are purely synthetic fibers, only absorb a small amount of moisture and the wearer starts to perspire very quickly. In contrast, Lenzing FR® is a natural, flame resistant fiber with excellent moisture absorption and breathability properties.

Protective clothing made with blends of Lenzing FR® and aramid fibers satisfies all the requirements of the wearer in terms of safety and durability, as well as comfort. Tests conducted by the Hohenstein Institute of Research in Germany confirm that blends with Lenzing FR® considerably improve the comfort and protection properties.

For more information contact:

**Lenzing AG**

Alexander Gstettner

Tel: +43 76727013290

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# Fire and Rescue Training





# Civil Defence Academy

## Civil Defence



*Firefighters undergoing training at Furnace*

THE CIVIL DEFENCE ACADEMY (CDA) of the Singapore Civil Defence Force (SCDF) offers specialized training in the area of emergency response including firefighting, rescue, emergency ambulance services and incident management.

Opened in 1999, the 11 hectare academy conducts courses for both local and overseas participants. It has strategic alliances with international organizations in the business of disaster assistance and coordination. In fact, the academy has trained participants from over 50 countries over the years.

### TRAINING FACILITIES

Training facilities at the academy includes a wide range of purpose-built specialist simulators, some of which are highlighted in this article. These simulators optimize state-of-the-art technologies to simulate realistic disaster conditions, including fires, smoke and heat, as well as systems for total control and monitoring of trainees' safety.

### TRAINING PHILOSOPHY

The training concept of the Academy is based on 2 key pillars. Firstly, training at the academy shall be realistic and training conditions must approximate those to be encountered during actual operations. This is because operating environments of emergency responders are inherently dangerous. For trainees to gain confidence and maximum competencies, their physical and mental limits will be stretched.

Safety is of utmost importance in all training sessions for this has an impact on trainees which extends beyond the confines of the Academy. Properly inculcated during training, the attention paid to safety becomes second nature to the trainees, long after they graduate from the Academy.



*The Civil Defence Academy (CDA)*

# Academy, Singapore Fire Force

## THE FURNACE (FIRE AND RESCUE TRAINING TOWER)

Possibly the “hottest” property in town, the 10-storey “Furnace” is designed and built to burn and withstand fires up to 1,000 degrees Celsius! Towering at a height of 38m at the Field Training Area, the Furnace offers a range of simulated fire environments at the push of a button. Fire and rescue trainees get to fight not only “residential apartment fires”, but also a host of many others including blazes in a hotel room, HazMat storage room, basement carpark and even a flash-over fire at a Karaoke Lounge.

A centralized control system lets the instructors gain full control of the fires, heat and smoke conditions in the building. Trainees are monitored for safety, via a network of closed-circuit televisions and thermal image cameras.

*Fire and rescue trainees get to fight not only “residential apartment fires”, but also a host of many others including blazes in a hotel room, HazMat storage room, basement carpark and even a flash-over fire at a Karaoke Lounge.*

## OIL STORAGE TANK FIRES

Measuring 7m in diameter and 6m in height, with controllable fire extent, the oil storage tank simulator allows trainees the opportunity to come face to face with life-like oil refinery fires. Trainees need to apply the correct extinguishing medium and equipment

## The Furnace, Field Training Area

to successfully extinguish the fire.

This massive simulator also requires trainee-firefighters to be aware of logistical requirements for such operations, including the amount of foam required and the proper placement of monitors to enable effective extinguishment of the fire.



Fighting simulated fire in Karaoke Room, Furnace





### LPG BULLET TANK

The LPG Bullet Tank Simulator permits trainees to battle an LPG tank impinged by fire. Trainees at this station must react fast to prevent a Boiling Liquid Expanding Vapour Explosion or (BLEVE) from occurring.

This simulator allows trainees to learn correct actions to take when encountering LPG incidents. It also develops confidence and teamwork as they negotiate movement towards the tank to shut off the valve.

### CHEMICAL PLANT SIMULATOR

This 3-storey chemical plant trains HazMat personnel and firefighters in HazMat mitigation operations. At the 1st and 2nd storey, trainees would be

required to contain HazMat leakages, including transferring of HazMat fluids, plugging and sealing operations.

At the 3rd storey, trainees will get to fight a “spill” fire involving overturned drums with flammable solvents and a BLEVE simulator cage. One of the LPG gas cylinders is capable of firing a 3m-high vertical fire.

### SHIP FIRE SIMULATOR

CDA trains about 3000 participants yearly in ship fire fighting. During the Basic Fire Fighting Course, trainees are taught the use of Breathing Apparatus and Compartment Fire Fighting using fire extinguishers and hoses. In the Advanced Course, they practise vertical

rescue techniques, and undergo scenario exercises involving both fire and rescue operations.

The two-storey 110 sq m ship simulator is constructed mainly of metal with five compartments, where different types of fires can be fired up, including flammable liquid leak fires.

The mess deck, galley, switch room and store room are located at the middle deck, while the engine room at the lowest deck. All compartments are accessed by means of water-tight doors and hatches. The doors and hatches come in “dogs” and “wheel-type” so that trainees understand the different types of mechanism in opening the doors. Like a ship, access between compartments for trainees is through tight vertical ladders and steep staircases.

The size and intensity of fires can be controlled by instructors at the Control room. All compartments can be smoke-logged and flooded to knee-high level to inject challenge. The ship simulator is also equipped with safety features. Thermal imaging cameras, gas detectors, temperature probes and emergency pull cords are available for the monitoring of trainees.

### INTERNATIONAL PARTNERSHIP

The Academy has built a wide network of strategic alliances with numerous institutions and organizations, both locally and overseas. To further enhance emergency service operations,

*The two-storey 110 sq m ship simulator is constructed mainly of metal with five compartments, where different types of fires can be fired up, including flammable liquid leak fires.*



Firefighters undergoing training at Furnace

## CONCLUSION

The Civil Defence Academy (CDA) of the Singapore Civil Defence Force (SCDF) has grown from strength to strength since its opening. Its commitment and dedication has made it possible for it to meet the challenges of conducting effective training for the ever-growing volume of local and overseas trainees.

The Academy conducted more than 600 courses in the last work year. The number of internal trainees rose from nearly 14,000 in 1999 to more than 21,000 in 2004. The number of external trainees rose even more dramatically – from about 2000 in 1999 to more than 9000 in 2004.

The CDA was awarded the ISO 9001:2000 certification by the International Organisation of Standardization (ISO) in Mar 2004.

The SCDF recently received the prestigious Singapore Quality Award (SQA). The business excellence model underpinning the SQA is based on universally accepted standards found in the US Malcolm Baldrige National Quality Award, the European Quality Award and the Australian Business Excellence Award.

More information about the CDA or SCDF can be found on <http://www.scdf.gov.sg/>



*Chemical Plant Simulator*

the Academy collaborates actively with local tertiary institutions on research projects.

CDA has also entered into Memorandum of Understandings (MOUs) with foreign universities to conduct Masters Programme, such as the Masters in Fire Safety Engineering with the University of Western Sydney, and Masters of Science Programme for Risks, Crisis and Disaster Management with the University of Leicester.

In addition, the Academy also collaborates with International Organizations

such as the United Nation's International Search and Rescue Advisory Group (INSARAG), the Asian Disaster Reduction Centre and the Japan International Cooperation Agency on matters pertaining to international rescue and training. The Academy has been conducting the International Search and Rescue course, International Hazmat course and the International Fire Fighting course since 1999.

*The Academy has been conducting the International Search and Rescue course, International Hazmat course and the International Fire Fighting course since 1999.*



*The Civil Defence Academy (CDA)*



# FIRE DEPARTMENT INSTRUCTORS' CONFERENCE

## Indianapolis, Indiana, USA April 24–29



few,” said FDIC Conference Director Diane Feldman.

FDIC's state-of-the-art exhibit hall allows people to see, up-close and personal, the latest technology, products and services designed for the fire and EMS industries. With more than 800 exhibitors consisting of top-notch manufacturers and suppliers, FDIC attendees can see what is new in the industry and how those products can help their departments. In addition, exhibitors and attendees also have many opportunities to network during exhibit hall hours and special events.

While training and education are the foundation of FDIC, another well-known aspect of the event is the tradition of brotherhood that attendees experience. “Stand alongside fellow firefighters from all over the world who are brought together at FDIC by a common bond—their desire to save lives, protect property, and go home safely at the end of the work shift,” said Feldman.

FDIC is designed for a broad-range of members of the fire and EMS industry. Career and volunteer firefighters, fire Chiefs, administrative Chiefs, line fire Chiefs, training officers, company officers, fire instructors, EMTs, paramedics, apparatus and equipment specialists, technical rescue and Haz Mat specialists and even fire academy and fire science students will find this elite training program a must-experience event.

Sponsors include E-One, Globe Manufacturing, Kidde Fire Fighting, Rosenbauer, American LaFrance, MSA, Class 1/Hale, Super Vac, Drager Safety, Spartan, Holmatro, Bright Star, DuPont, Pierce, HAIX, Paul Conway Shields, Federal Signal, Fire.com, Darley, Ferrara, Hurst and Whelen. FDIC is hosted by the Indianapolis Fire Department and co-sponsored by the FAMA, FDSOA, FEMSA and Indianapolis Fire Fighters IAFF Local 416.

Registration opens mid-December. Attendees may find additional event information and register online at [www.FDIC.com](http://www.FDIC.com). Early bird discounts rates are available through March 13, 2006. For questions regarding the event, please call +1-888-299-8016.

**THE TIME-HONORED TRADITIONS of the Fire Department Instructors Conference (FDIC) are once again coming to Indianapolis, Indiana, USA April 24–29, 2006. Hands-on training, education, the latest in technology and products, and networking opportunities are just some of the exciting aspects of FDIC.**

FDIC kicks off with its signature program, H.O.T. (Hands-on Training) sessions. Attendees experience, in an interactive training environment, some of the most intense training courses that focus on a range of topics from vehicle extrication to collapse rescue. Working through challenging situations in real-life settings, H.O.T. attendees experience first-hand the dangers they'll face in their jobs and learn the best way to prepare and safely work in such conditions. Led by leading industry experts in the United States, Hands-on Training sessions give participants advanced knowledge and skills that can easily be brought back to their firehouses to train other members of their departments.

From the H.O.T. training grounds, participants take their hands-on experience and apply it in a classroom setting. FDIC boasts a comprehensive conference featuring more than 120 powerful and pertinent classroom sessions that cover new developments in training, current events in the fire industry, management and legal issues. Taught by the fire training industry's top instructors,

classroom sessions provide attendees the information they need to do their job well and safely.

“FDIC addresses the concerns and training needs of first responders worldwide – with seminars that traditionally cover such topics of general interest as response to terrorism, protecting industrial facilities, search and rescue, structural collapse rescue, low-cost training, becoming a better instructor, lessons learned from major incidents, response to natural disasters, rescuing our own, and hazardous materials, to name a



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## EXHIBITION & CONFERENCE

FIRE ASIA 2006 is the leading three-day event in Asia for fire prevention, protection and safety. Bringing together over 1,600 fire and emergency service professionals from around the world, FIRE ASIA 2006 combines a high

profile Exhibition and cutting edge Conference programme effectively providing an international one-stop-shop for everyone involved in the firefighting and fire prevention industries.

Themed 'Best Practices in Life Safety' the Conference will focus on lessons learned from the recent natural disasters and atrocious terrorist attacks. Participants in the Conference will be exposed to new concepts and ideas on topics surrounding disaster management, preparedness for terrorist attack, public health emergency planning and disease surveillance.

### Conference programme highlights include:

-  'London Bomb Attack in July 2005' by **Mr Ken Knight**, Commission, London Fire & Rescue Authority
-  'Trauma Diversion in a Modern City' by Prof. **Tim Rainer**, Director, Accident & Emergency Medicine Academic Unit, The Chinese University of Hong Kong
-  'Study of Crowd Movement' by **Dr. Siu-ming LO**, Associate Head & Associate Prof., Department of Building and Construction, City University of Hong Kong
-  'Is it time to move to the next level of Fire Protection?' by **Mr. William A. Stewart**, Fire Chief, Toronto Fire Services, Canada

## 9th WORLD FIREFIGHTERS GAMES

The World Firefighters Games, scheduled from 18–25 February, is an additional exciting event associated with FIRE ASIA 2006 with the opening ceremony taking place immediately after FIRE ASIA 2006. This prestigious event attracts firefighters and senior personnel from around the globe to Hong Kong, providing the ultimate networking opportunity.

## INDUSTRY EXPERTISE

The organiser of FIRE ASIA 2006, dmg world media (uk) ltd, has been serving the fire industry since 1908 and is also the publisher of the leading industry publication, *FIRE* magazine – the voice of firefighting and fire prevention.

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# CBRN training – A Practical Approach



By Steven Pike of  
Argon Electronics

AS AWFUL AS THE bomb attacks in London on 7th July were, what they demonstrated by virtue of the superb response of the emergency services was the value of planning and training.

Training in preparation for a CBRN (Chemical, Biological, Radiological, Nuclear) related incident presents its own problems. The detection equipment used tends to be specialised, and invariably only of use for such incidents. Therein lies a conundrum, in that the less frequently a piece of operational equipment has to be used, the less familiar the users are likely to be with its correct operation. The nature of incident at which such equipment is likely to be used is such that there is no room for “on the job training” so to speak. A further consideration is the increased cost of ownership of real detectors as a result of any damage that may have occurred during training, not to mention the potential lack of operational availability.

The skills associated with using detection equipment extend beyond basic usage, in that correct search procedure must be practised, to ensure even the smallest trace of substance is detected, not least for forensic/evidential reasons. We then have communication of the detection readings through the command chain, and the subsequent decisions made.

A simulation concept developed

initially for military chemical warfare training has been adapted over the past years to satisfy the needs of the civil “Blue Light” community. In particular, a version has been developed to simulate the “Police E-CAM” developed by Smiths Detection in conjunction with the tri service user group at the United Kingdom Police CBRN training centre, Winterbourne Gunner.

The technology uses a safe environmentally friendly method to simulate not just chemical warfare agents, but also toxic industrial compounds and gases, facilitating simulators for toxic

gas and depleted oxygen monitors as used in confined space entry. Because the simulation technology is electronic, not only is it safe and environmentally friendly, it can be used in virtually any environment, including a potential target area be that indoor or outdoor.

An ultrasound source is used to simulate chemical vapours. This source can be programmed to represent different substances such as chemical warfare agents, toxic industrial compounds, explosive atmosphere, depleted oxygen or specifically substances that can simulate false positives (false readings) on detection equipment.

The source can be used outdoors or indoors, and simulates vapours leaking through doorframes, open windows

*A further consideration is the increased cost of ownership of real detectors as a result of any damage that may have occurred during training, not to mention the potential lack of operational availability.*





and packages in an extremely realistic manner. A variable output power enables instructors to set up their scenario precisely as they wish to. You can for example hide the source within

a vehicle such that the simulator detects a reading close to the seal of the luggage storage compartment. If you place the source under a car seat and leave the window slightly open you



*Ultrasound source used to simulate chemical vapour*

will detect simulated vapour as you approach the open window. The stable nature of the source means the scenario will not change unless the instructor chooses, avoiding wasted training time due to simulants having dispersed or training grounds having become saturated.

Electromagnetic packs representing different substance types can be hidden within the protective clothing of operatives, or even within footwear to simulate contamination. Using a combination of sources it is very easy to implement a wide variety of CBRN exercises within a matter of minutes in almost any environment.

A typical exercise scenario might involve a building with a number of rooms including a kitchen and an associated garage with a vehicle inside. The instructor can place simulation a source in one of the rooms and close the door, the source being placed such that a low level reading is obtained as the detector samples the gap at the base of the door towards the floor, or the area where the door meets the door frame.

A second ultrasound simulation source could be placed in the kitchen inside a cupboard under the sink. This is because cleaning substances that would typically be stored under a sink may well cause false positives, and it is important that students appreciate that detectors are not perfect, and just because a reading is obtained it does not necessarily mean a chemical warfare agent has been detected. Consideration



*Contamination of casualties etc. is easy to simulate*

should always be given to the circumstances under which a reading was obtained, and this element of the scenario helps reinforce that teaching.

Because the system can simulate multiple substances in the same exercise, the instructor can deploy sources to simulate both Nerve and Blister agent at the same time, for example. Perhaps the Blister source and one of the nerve sources can each represent false positives, which additional Nerve sources simulate live agent. The purpose behind such a scenario is to ensure students continue to seek all types of substance, and not fall into complacency as a result of the first reading, which may have been a false positive.

A third ultrasound simulation source could perhaps be placed within the vehicle in the garage. Depending upon how high we set the simulation source, we can arrange for the student to obtain readings as soon as they open the garage door, or only if they search the car carefully, perhaps to find a back pack which appears to be leaking a suspect chemical vapour.

Electromagnetic sources can if desired be placed within simulated casualties clothing, and the casualty strategically placed within the building to simulate contamination of their clothing. In reality of course it would not be known if the casualty was innocent or not, reminding the student that they are also dealing with a crime scene.

Such a scenario tests a number of skills. Perhaps the most important of these is search technique. It does not matter how good the detection equipment is, unless the search technique is thorough, what might be a small but significant reading might be missed with dramatic consequences. One of the most valuable lessons learned – the process takes time! This brings additional issues to the exercise – do we have adequate air tanks, what is the working duration of the response team due to body core temperature/stamina issues.

*Electromagnetic sources can if desired be placed within simulated casualties clothing, and the casualty strategically placed within the building to simulate contamination of their clothing.*




Any attempt to open the door will result in a rapidly increasing reading on the simulator. Pic courtesy British Transport Police

As you can see, much more than correct detector use is introduced as the result of such a practical exercise.

Perhaps one of the more difficult aspects of any form of training is dealing with individuals who have clearly not


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Offering one of the finest emergency response programs and training facilities in the world, the University of Nevada, Reno Fire Science Academy (FSA) includes a 426-acre, state-of-the-art campus in Carlin, Nevada, as well as specialized instructional programs — conducted at the academy or customized and offered anywhere in the world.

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For a program catalog or more about what FSA can offer your company, organization or agency, contact:

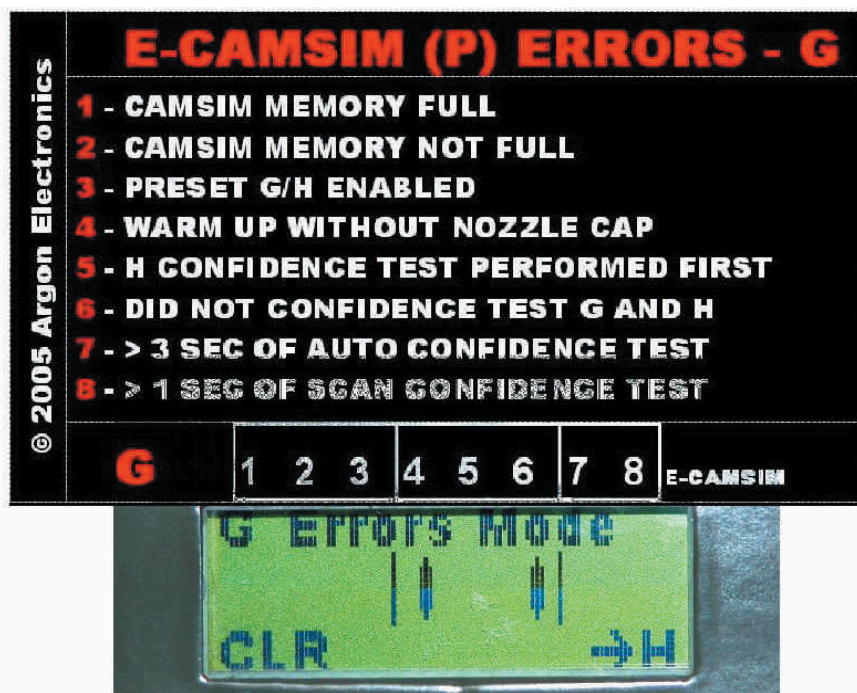


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E-mail: [fireacademy@unr.edu](mailto:fireacademy@unr.edu)







Each bar represents a student error – or learning opportunity!

taken on board the classroom lesson! Whilst a practical exercise goes a long way towards confirming that either the students have listened or the instructor was good at teaching, the

ability to independently verify has clear advantages.

Embedded within the simulator are the rules associated with correct use of the genuine detector. The students use

of the simulator is constantly compared with these rules (or doctrine) and any deviation recorded for later review. This has a number of advantages in that it de-personalises the critique of the exercise, and as such overcomes difficulties explaining mistakes if the student is of higher rank than the instructor or if cultural issues arise.

The system is currently in use by a number of UK, and international law enforcement and response agencies for CBRN training and has been employed in numerous exercises with great success. The flexibility of the system has permitted training to take place in a variety of locations and in all weather conditions. Further developments continue and include implementation of the technology to simulate other types of hazardous material detector such as the Proengin AP2C, Bruker Raid, Envirochem Chem Pro 100, SAIC S-Cad and Inficon Hapsite.

Steven Pike is the founder of UK based Argon Electronics and holds a number of patents relating to the simulation of hazardous material.


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# ROSENBAUER INTERNATIONAL AKTIENGESellschaft

## ARFF vehicle PANTHER 8x8 MA-5 and 6x6 CA-5



PANTHER 8x8 MA-5

The original PANTHER was introduced in 1991 and its design form has been emulated all over the world.

Now in 2005, the design and technology of the PANTHER 8x8 and 6x6 series have been updated to give you "state-of-the-art design and technology". We placed special emphasis on ergonomics, passenger safety, modern materials, powerful fire fighting technology, and EURO 3 compliant drive units.

### CAB Safety

The construction with FEM calculations complies with the ECE R 29 crash test standard (frontal pendulum impact test and roof load of 1.5 t). The cabs for the previous 6x6 version for ASA Australia also complied with this standard.

**360-degree view:** Completely transparent doors and a front screen that extends upwards to give the driver and passengers perfect all round vision. All screens are made of safety glass – with a front screen of laminated glass.

**Ergonomics:** The steeper angle of the front windscreen gives the driver and passengers more headroom, and the wide doors make the cab feel more spacious. The roof hatch located behind the monitor allows for quick and safe manual release in case of emergency. The newly designed dashboard with central display/control elements located between the driver and the off-side passenger support genuine one-man control of the vehicle's fire fighting technology, based on the new Rosenbauer (LCS Logic Control System) control concept.

The PANTHER 8x8 cab has electrically operated swing doors. When open, the doors point forward and allow the driver to put the wheels on full lock. The electric drives enhance actuation control.

- Climate control with constant temperature in the cab
- Seats: 1 + 2 (8x8 design in compliance with ADV)

The PANTHER 6x6 cab has revolving doors that open through 90° and gas spring supported actuation.

- Manual climate control
- Seats: 1 + max. 5

### SUPERSTRUCTURE

Focused use of premium, corrosion-resistant materials (aluminum, GRP formed parts and covers, polypropylene extinguishing agent tanks)

### Full height GRP locker between the axles

The covers, which open vertically, protrude only slightly from the vehicle thus reducing the danger of injury.

The PANTHER 8x8 has pneumatically operated locker covers, which can be controlled from the cab. The engine/pump compartment cover can be raised hydraulically to improve access for maintenance and servicing work.

In contrast to this, the PANTHER 6x6 has manual locker covers.

### Lighting and electrical system

Xenon main headlight unit, rear LED lights and CAN bus technology for chassis and fire fighting technology with the PANTHER 8x8.

### FIRE FIGHTING TECHNOLOGY

The RM60E roof turret and the RM15E bumper turret have been completely redesigned and combined with fire pumps for improved performance and innovative controls.

The PANTHER 8x8 now has an N100 low-pressure pump for performance of 8000 l/min at 10 bars and a H5 high pressure pump for 300 l/min at 40 bar.

With the new, electronically controlled RVME 600 around-the-pump proportioning system.

The PANTHER 6x6 retains the tried and trusted combination of the R 600 N2 with RVMA 500 for 6200 l/min at 11 bar.

### CHASSIS

The variety of different fire fighting, cab and superstructure solutions clearly demonstrate that the Rosenbauer construction team has designed a series that supports a wide range of variants. And chassis are no exception.

On the one hand, there is the PANTHER 8x8 MA-5, the new 1000PS MAN rear-engine chassis with Allison automatic transmission (Type MAN SX 40.1000 8x8), and on the other the PANTHER 6x6 CA-5 with its completely new Rosenbauer Motors USA 705 HP rear-engine chassis, Caterpillar 4-stroke diesel, and twin disc automatic transmission.



PANTHER 6x6 CA-5

Type Labeling Appendix: MA (stands for MAN engine), CA (for Caterpillar engine). Both chassis comply with the Euro3 directive and have 24V vehicle voltage, which ROSENBAUER believes will help boost sales of the 6x6 vehicle on the European market.

For more information contact:

**Rosenbauer  
International  
Aktiengesellschaft**

Walter Dolezal  
Advertising and product  
information

Tel.: +43 (0)70 6794-402  
Email: office@rosenbauer.com



# Taking fireground safety to a new dimension.



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A fully automatic, electronic breathing apparatus control system, this unique device will allow your Entry Control Officer to monitor the exact status of up to 12 individual team members simultaneously from outside the incident. This innovative system provides pneumatic data, personal alarm monitoring and evacuation signalling - eliminating the calculations and guesswork that can lose vital time in an emergency.

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# PROCUREMENT GUIDE

## COLLINS YOULDON

Collins Youldon is a family owned and managed company operating from the South East of England. The company exports around 50% of hosereel production throughout Europe.

The philosophy of Collins Youldon concentrates very much on producing a high quality product and providing excellent service to all customers. However, the company understands that price is all important, and therefore it constantly strives to invest in tooling and production methods aimed at reducing the unit cost of the equipment. By continual investment the company is able to maintain costs, seek out product improvement and work towards the design and development of new products.

By working closely with the UK fire brigades and European vehicle builders the company has developed several new options for vehicle mounted hosereels, including the HR51BE combi reel, providing air rewind with an emergency

manual rewind facility which is angled downward towards the operator (see photo).

As an additional service, Collins Youldon provides literature in several languages and is able to communicate in English, German, French and Spanish by providing in house one-to-one training to its specialist translation staff.

The company is also able to offer a range of cable storage drums for quick and easy deployment of power cable and air hoses. The drums are strong, fabricated from steel which is powder coated for a tough finish.

In the United Kingdom Collins Youldon hosereels are fitted to 99% of all new vehicles and are widely specified in the fire industry where their reputation for reliability and prompt technical assistance is well known.

*For more information please contact*

**Collins Youldon**

Tel: +44 (0) 1279 431011

Fax: +44 (0) 1279 433110

## DRAEGER LIMITED

Any area can become a confined space under certain conditions. For example, an open ditch or open-topped vault becomes a confined space if air circulation inside is poor and a gas that is heavier than air accumulates at the bottom. Similarly, a structure or irregular shape becomes confined if pockets of gas or vapour accumulate where air circulation is restricted.

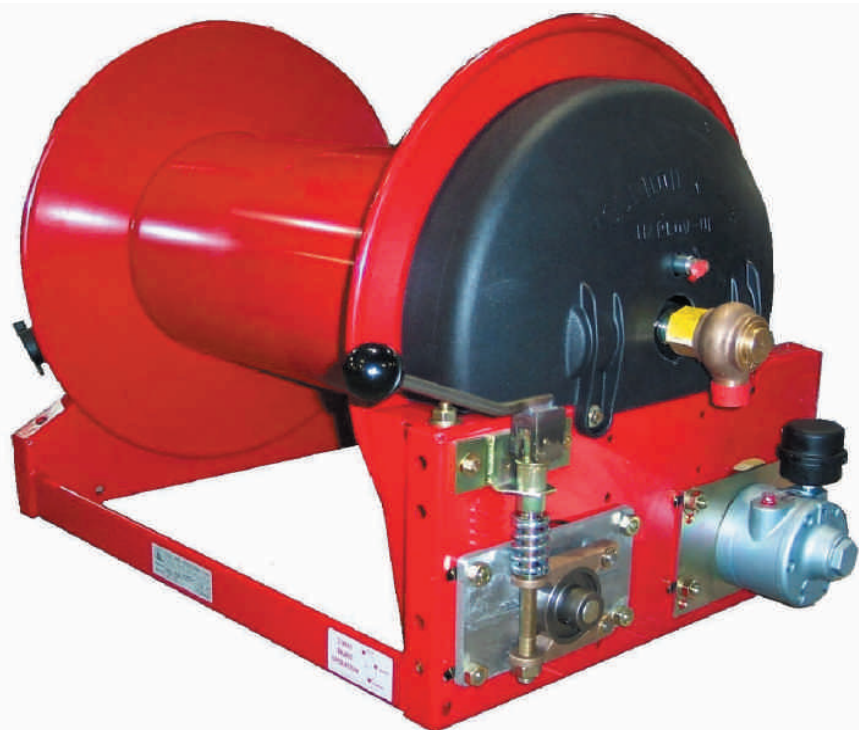


By providing effective training in the selection and use of gas detection equipment, such as that carried out at Draeger Safety's purpose built sewer and crawl galleries at Blyth, employees can be shown how to assess, understand and control the hazards involved.

The seriousness of the hazard is obviously dependent upon the nature of the substance and/or the application concerned. The dangers can be dramatically increased, however, if a combination of hazards exists.

Toxic gases or vapours, for instance, can poison or suffocate personnel and work in progress, such as cleaning, welding and painting can produce dangerous fumes. It is also possible that the toxic gases and vapours that are created during previous work might still be present upon re-entry at a later date.

A build up of flammable gases or vapours can also burn or explode and



HR51BE combi reel



an atmosphere containing less than 21 per cent oxygen is oxygen deficient and can be life-threatening. It can also lead to euphoria, a "happy" state which prevents the worker from realising the dangers in time to escape.

The most frequent causes of serious accidents are that people do not always recognise a confined space hazard when they see one. To ensure absolute safety, employees should always assume that hazards are present until they are sure that they are not. It is obviously essential that workers first test and then continue to monitor the confined space before entering the area and whilst working within it. For this reason, the Draeger course highlights the need to use appropriate equipment in each area, i.e. at the bottom of the space and in corners and explains why areas should be tested, cleaned and tested again. It also covers the use of breathing apparatus and respiratory protection equipment as well as general safety procedures.

For more information please contact  
**Richard Beckwith**  
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Ullswater Close  
Kitty Brewster Ind Est.  
Blyth  
Northumberland NE24 4RG  
Tel: 01670 352891  
Fax: 01670 356266

### DRAEGER SAFETY UK LIMITED

#### Reliable personal monitoring and no maintenance worries for two years with new Draeger Pac 3000

Ideal for use by all those with a need for regular personal monitoring, the new Draeger Pac 3000 single gas instrument can be used to detect carbon monoxide, hydrogen sulphide or oxygen. Easy to use and ensuring reliable monitoring of ambient air, this innovative personal monitor is also completely maintenance free for two years.

Featuring the new Draeger XXS sensors, which do not have to be replaced during those two years, the Pac 3000 offers extremely short electrochemical reaction times and responds immediately to any gas hazard.

Small yet robust and featuring simple push-button operation as well as a



*The new Draeger Pac 3000 single gas instrument can be used to detect carbon monoxide, hydrogen sulphide or oxygen*

language-free, back-lit liquid crystal display, the Pac 3000 also incorporates an infra red interface to make configuration and calibration easy.

Equipped with vibrational, visual and two-tone audible alarms, the Pac 3000 displays the actual hazard concentration as well as the alarm type. A warning will also be issued in the event of a malfunction, before the end of the unit's useable life, or before the battery is fully discharged.

For maximum reliability, the display also features a bump test icon that informs the user as and when a function test is required. This can be easily carried out with a Draeger Bump Test Station whilst the Bump Test mode can be configured, calibrated and adjusted via PC using Pac Vision or CC-Vision software. Several instruments can also be configured and calibrated at the same time with the Draeger E-Cal system.

Protected by a tough, rubber housing and meeting the requirements of IP65, the Pac 3000 is easily fastened to workwear by way of a secure crocodile clip.

Stockist details can be found at [www.draeger-safety.co.uk/PAC](http://www.draeger-safety.co.uk/PAC).

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### FIRE DEPARTMENT INSTRUCTORS CONFERENCE



The time-honored traditions of the Fire Department Instructors Conference (FDIC) are once again coming to Indianapolis, Indiana, USA. Hands-on training, education, the latest in technology and products, and networking opportunities are just some of the exciting aspects of FDIC.

For the latest in interactive training, attendees can experience FDIC's signature programs, H.O.T. (Hands-on Training) sessions. Respected industry experts take students through intense

training courses that focus on a range of topics from vehicle extrication to collapse rescue. Working through challenging situations in real-life settings, H.O.T. attendees experience first-hand the dangers they'll face in their jobs and learn the best way to prepare and safely work in such conditions. The knowledge and skills they gain can easily be brought back to firehouses to train other members of their departments.

FDIC also boasts a comprehensive conference featuring more than 120 powerful and pertinent classroom sessions. Taught by the fire industry's top instructors, classroom sessions provide attendees the information they need to do their job well and safely.

FDIC's state-of-the-art exhibit hall allows people to see, up-close and personal, the latest technology, products and services designed for the fire and EMS industries. With more than 800 exhibitors consisting of top-notch manufacturers and suppliers, FDIC attendees can see what is new in the industry and how those products can help their departments. In addition, the exhibit hall offers many networking opportunities for both attendees and exhibitors.

FDIC is designed for a broad-range of members of the fire and EMS industry. Career and volunteer firefighters, fire Chiefs, administrative Chiefs, line fire Chiefs, training officers, company officers, fire instructors, EMTs, paramedics, apparatus and equipment specialists, technical rescue and Haz Mat specialists and even fire academy and fire science students will find this elite training program a must-experience event.

Sponsors include E-One, Globe Manufacturing, Kidde Fire Fighting, Rosenbauer, American LaFrance, MSA, Class 1/Hale, Super Vac, Drager Safety, Spartan and Whelen. FDIC is hosted by the Indianapolis Fire Department and co-sponsored by the FAMA, FDSOA, FEMSA and Indianapolis Fire Fighters IAFF Local 416.

Attendees may find additional event information and register online at [www.FDIC.com](http://www.FDIC.com).

For questions regarding the event, please call +1-888-299-8016.

## COMNET – MAJOR INCIDENT AND CRISIS MANAGEMENT SUPPORT TOOL

Fortek's solution *ComNet*, a Major Incident Support solution, is designed to assist Fire Services in managing major incidents and crisis situations efficiently whilst minimising exposure to risks and hazards. ComNet embodies major incident plans, local risk information and generic ICS organisation structures to assist operational staff to formulate effective response strategies. Using a combination of graphical, geographical and textual user interfaces ComNet presents a comprehensive view of the current status of the incident and the activities of the resources deployed to the incident.

ComNet features many valuable components that enable Fire Services to carry out their work efficiently. Through ComNet, action plans can be activated, progressed and monitored. An incident narrative allows all relevant messages to be recorded, each with a message category flag which is used to indicate the importance, confidentiality, or interest level. A risk assessment tool is available to record identified risks, their severity and likelihood, and the associated risk reduction actions have been put in place to minimise exposure to hazards. ComNet also utilises the Internet/Intranet technology to provide a consistent and continuously updated view of the incident to all authorised users, anywhere in the world.

ComNet is an effective support tool for major incident and crisis management. It is a part of the Fortek's family of Emergency Services product portfolio, which includes Emergency Planning, Major Incident Management and Command, Control and Communications solutions. All Fortek solutions can be used as standalone solutions or can be integrated to formulate a fully operational system to take total control of all operational activities from the very beginning to the end.

Fortek Computers are renowned for its pioneering solutions and services for the Emergency Services in the global arena. The company is continually forging ahead with new concepts, solutions and services that offer flexibility and will help to shape IT within the Fire Services.

George Godliman, the managing director comments: "This is very exciting time for us, after 25 years in the business Fortek goes from strength to strength. Our success is our commitment to the market place in the UK and worldwide, listening to our customers, delivering innovative solutions and investing into a team of highly skilled professional designers and developers. This makes Fortek a unique and a formidable choice".

*If you would like to have further information on Fortek's solutions and services please contact:*

**Louise Godliman**

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alternatively email [louise@fortek.co.uk](mailto:louise@fortek.co.uk)





## INTRODUCING GRINDEX TURBO

### Tailor made pumps for slim needs

The new submersible Turbo pumps from Grindex are designed for drainage works in narrow spaces. The pumps have a central discharge, allowing them to be used in 8" and 12" tubes. Typical applications include drainage in filter tubes in cohesive soil and dewatering in confined spaces.

The Turbo pump from Grindex is available in two sizes, 8" and 12". Turbo 8 is a completely new pump, developed for drainage works in 8" filter tubes and other narrow spaces. It has a maximum flow of 14 l/sec and pressure head of 36 m. Turbo 12 is developed from the well known Proline pumps Minor, Major and Master. The pump has a new designed top and can be used in spaces down to 12". It can deliver a flow up to 55 l/sec and pressure head of 70 m. Grindex unique built-in air valve enables dry running capabilities without overheating. All Turbo pumps are equipped with thermo switches in the stator windings, allowing the use of an overheating protection system.



*The Turbo pumps are designed for use in narrow spaces and for temporarily lowering the water table at construction sites*

We have seen an increasing demand of the Turbo pumps at construction sites, where the ground water table needs to be lowered temporarily while the foundation work is carried out, says Gunnar Benselfelt, Marketing Manager at Grindex. By lowering the water table locally with a number of Turbo pumps, the concrete works can be done with low impact on the water table surrounding the construction site.

The Turbo pump is also useful for drainage in other narrow spaces, like during pile driving works. When operating in cohesive soil, the pump can be installed in a filter tube that keeps the soil from entering the pump.

To ensure a reliable operation, the

Turbo pumps are equipped with double mechanical seals in an oil bath that lubricates and cools the seals. The pumps are designed for continuous operation in demanding environments and can handle pH values from 5 to 8. The impellers are made of chrome-alloyed white cast iron and wear parts made of nitrile rubber for the highest endurance against wear from soil, sand, drill cuttings and alike.

The new Turbo pumps are manufactured mainly from Grindex standard components. Not only does this make servicing faster and easier, it also reduces spare parts inventory.

*For further information please contact:*

#### **Grindex AB**

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## HUGHES SAFETY SHOWERS

The latest addition to the Hughes range of decontamination systems is the CUPOLALightweight walk-through decontamination shower.

The CUPOLALightweight Mk1 is a compact, multi-purpose unit designed for rapid response in the event of CBRN incidents and industrial chemical spillages. A Mk2 version of the unit can accommodate two stage decontamination.

It is easily carried in its high visibility valise which opens out to form a protective ground sheet. This is permanently attached to the base of the unit and provides protection against sharp



*CUPOLALightweight Mk1 walk-through decontamination shower*

objects when the system is being positioned or when it is in use. Joints on the inflatable frame are glued and taped, rather than welded, as this has proved to be a more reliable method.

An air cylinder with the kit provides a low pressure supply to inflate the four legs and create a frame to support the removable liner. An additional air inlet is also available so that the shelter can be inflated using an independent cylinder or air supply. A pressure relief valve prevents over-inflation of the frame.

Showering takes place within a removable translucent liner hung from the inflated frame using Velcro sleeves. Entrance and exit flaps in the liner can be sealed to contain the overspray during showering. The wash-off is collected in a sump in the base and can be pumped out through a waste connection in the liner.

Support personnel can monitor the decontamination process through windows on both sides of the unit and offer assistance by using the integral gloves fitted in the liner wall.

Seven nozzles at head and chest height ensure rapid and thorough showering. These can be supplemented using a hand-held wash brush fitted to a coiled hose. To ensure stability in adverse conditions, the unit can be secured to the ground using guy lines and pegs. The shelter is intended to withstand repeated use in the most demanding conditions, and a repair kit is included in case a puncture occurs.

Hughes Decon shelters cover the complete range of applications, including models for decontaminating emergency service personnel and high-throughput units for decontaminating the general public.

*For more Information please contact:*

#### **Hughes Safety Showers**

Tel: +44 (0) 161 430 6618  
Fax: +44 (0) 161 430 7928

## THE NEW MAGIRUS "TURNABLE LADDER/PORTABLE FIRE ENGINE – CONCEPT"

The combination of turntable ladder and fire pump within a single vehicle unit is a much-in-demand configuration, especially for export sales that, as a rule, has so far been implemented by



means of permanently installed pumps. However, these solutions involve additional effort and not inconsiderable cost.

MAGIRUS has now developed an innovative and clearly more low cost solution that, in addition, also features tactical operational advantages such as flexibility and user friendliness. The new concept is based on a series standard MAGIRUS FIRE portable fire engine (TS 10-1000 or 10-1500) that is carried on a pneumatic lift permanently mounted on the platform. For many years, this technology has been proven on a wide range of different fire-fighting vehicles and provides for a fast and, above all, ergonomic removal of the portable fire engine.

This innovative but at the same time simple solution can be well described by using the example of a DLK 52 CC-S delivered to the fire department in Nanjing/China. Directly to the rear of the driver's cab, the suction hoses are stored; the removal device is permanently connected to the platform, and the portable fire engine can be set down continuously on the copilot's side.

The pump can be operated when it has been set down as well as when it is supported on the lift. Water suction can be effected optionally via open waters or, by means of a manifold, via a fire hydrant.

The smoothness of the 4-cylinder in-line engine with 54 kW (74 hp) at 6000 rev/min ensures that no vibrations are transferred to the vehicle; the efficiency of the pump guarantees an excellent water delivery up to the cage monitor.

This pragmatic solution shows yet again MAGIRUS impressive user-orientated force of innovation.

*If you have any queries, please contact:*

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## JAPANESE DEFLATE IN FAVOUR OF METAL FRAMES

### PPS Secures Osaka Airport RD Shelter Order

An order for six rapid deployment shelters has been placed by the KIAC company with Professional Protection Systems. KIAC are the company responsible for providing facilities of all kinds at Japan's airports and the six shelters, the first of a much larger order, are destined for Osaka airport.

The shelters, all based on the design of the metal frame units, which PPS has supplied to the UK government to house its mass-decontamination facilities, represent a major change in Japanese thinking which until now has been centred on inflatable units.

According to Mark Whitcher, PPS Managing Director, the change in thinking was based upon the longevity



PPS Rapid Deployment Shelter

and flexibility of metal frame systems and the fact that they do not spring leaks and if damaged can usually be repaired with great swiftness and relative ease. "This plus the fact that they can be deployed with the same speed as an inflatable clinched the deal I believe" says Whitcher.

Internally the spatial arrangements of the shelter interiors allow for a number of different uses; as command posts, field hospitals, scene of crime operational centres and so on.

Japan's emergency services and defence forces are already familiar with PPS equipment and are amongst the company's earliest export customers, buying the then revolutionary PPS inflatable decontamination shower in the wake of the infamous Tokyo Sarin attack. "Because of this I believe the Japanese have faith in us and what we have to offer, and this must have contributed significantly towards getting them to change from inflatable to metal frame technology and to placing the order with us" comments Whitcher.

*More information from:*

**Plays Protection Systems Ltd.**

Protection House

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## SK FIRE LIGHT RESCUE UNIT

One of a recent batch of six units supplied to Hong Kong Fire Service, this Light Rescue Unit (LRU) is based on a Mercedes Benz Vario 815 four door panel van with an Allison automatic transmission.

The LRU van's air-conditioned passenger compartment is configured to carry a crew of six (driver plus five), with the 4 rear crew seats fitted with quick-don BA brackets. The unit functions as a first response fire fighting/rescue appliance carrying a comprehensive range of equipment and specialised rescue tools for this purpose, which are readily retrieved from their stowed positions from the sides of the vehicle.

Utilising a proven Rosenbauer design, the walls of the panel van are





SK Fire Light Rescue Unit (LRU)

removed and replaced with a stiffening structure and 2 large roller shutters on each side. An interior structure is fitted to support stowage racks and drawers. This structure also serves to increase the load bearing of the van's roof. The rear doors are replaced with a single large roller shutter, which permits maximum space utilisation, and does away with the need to 'fight the wind' with doors on windy days.

The pull-out draws using a drop down lock design and the low height stowage racks allows for easy retrieval and stowage of the equipment carried.

Stretchers are housed in the centre internal section of the body, which is accessed from the rear roller shuttered compartment.

A moulded GRP roof with non-slip profiled top decking provides secure footing for firemen. The roof carries a short extension rescue ladder. Access to the roof is by a hinged swing-out ladder.

A 'FIREXPRESS', Mobile 50 self contained fire fighting unit is mounted on a pull-out turntable in the rear compartment for quick deployment, and a front mounted recovery winch is fitted to the front of the vehicle.

For more information please contact:  
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**SPENCER ITALIA S.R.L.**



Parma, Italy, 7th November 2005 – Spencer developed a complete line of Evacuation Chairs and systems, outlined on the new website [www.evacuationchair.net](http://www.evacuationchair.net).

## EVACUATION SYSTEMS

### Why

The September 11th events changed the world for ever but have also been an opportunity to revise evacuation and first-aid procedures as never before.

The truth is that the request for evacuation is a less probable necessity in case of a terrorist attack than in that everyday life, like during natural disasters, gas leakages, chemical disasters, black-out or fire.

September 11th taught us also that, during an emergency evacuation, assistance is necessary not only for the disabled. In many cases, assisted evacuation may become a necessity due to severe disabilities, age or advanced mental and/or physical stress.

It is a reality that today logistic emergency operators recognize the value and the importance of products which render evacuations much more efficient.

### Spencer's Solution: Skid Series

The most relevant technical/aesthetic novelty of this article is the adoption of passive caterpillar belts which effortlessly glide downstairs, with an elevated level of security.

On landing, the constructive geometry of the unit transfers all weight on the main wheels to allow turning and movement. Moreover, the Pro Skid version is equipped with front AND rear telescopic handles which allow upstairs transport. A careful examination of the whole chair will reveal a seat that has



been very carefully studied; aesthetically and in its conceptually free styling.

The aggressivity has been achieved by the mixing of technical requirements. For example the tortuous conformation of the welded frame or the obvious originality of the seating posture. The precocity of the aesthetics is underlined by the distribution of the angles, the backrest that can be telescopically inclined, the adjustable headrest and the handles for transportation that can also be detached from the chair itself.

Innovative design and the maximum of security possible when in use, make the new Skid Series an absolute novelty within the environment of evacuations and transport.

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## TYCO UNVEILS NEW RAPID INTERVENTION FIRE TRUCKS

Tyco Fire and Security has unveiled two new Ansul-branded Magnum Rapid Intervention Vehicles – the Magnum 440 and Magnum 480. The trucks are ideal for airports, municipal fire departments, industrial sites and military bases, where mobile, rapid response fire suppression is essential.

Both models offer Purple-K dry chemical and Ansulite AFFF foam twin-agent technology. This operated by a joystick in the truck's cab, allowing the agents to be used simultaneously or separately, depending on the type of fire. The Purple-K acts as a knockdown agent, while the AFFF blankets the fire, allowing valuable extra time to be added to the rescue operation. When combined, the twin-agent suppression prevents the escape of flammable vapours and provides a degree of cooling. The Magnum 440 holds 204 kilograms of Purple-K and 681 litres of AFFF, while Magnum 480 contains 612 kilograms of Purple-K and 1362 litres of AFFF. Small fires can also be extinguished using a 30-metre dual-purpose hose reel that is stored in the rear of the trucks.



*Tyco Magnum Rapid Intervention Vehicle*

Seating a four-person crew, the 4x4 trucks have a durable commercial aluminium chassis with diamond-plate catwalk surfaces. They also have a number of new and improved features, including rubber-track tyre conversion for extreme terrains; adjustable slide-out shelving; in-compartment lighting; four 120 amp electrical outlets; fixed-mount perimeter lights; and rear scene lighting. The new vehicles also offer a rear view video system that can be monitored from within the cab; infrared thermal imaging to aid safe navigation through smoky areas; roll-up compartment doors; front and rear tow hooks; and an NFPA compliant siren.

Andrew Shiner, Tyco's Director of Marketing for Europe, the Middle East and Africa said: "Compared with their competitors' custom-made vehicles, both of the new Rapid Intervention Vehicles are manufactured in a fraction of the time. They are extremely light-

weight and versatile, and so can manoeuvre through congested or rough terrain. They will transport a team to the fire regardless of environmental obstacles, such as fallen debris."

He concluded: "We are 100 percent committed to developing ever more advanced fire safety solutions. The Magnum 440 and Magnum 480 are the most evolutionary fire trucks on the market. Combined with our training and technical support they will prove themselves the best solution every time."

This latest addition to Tyco Fire and Security's fire safety offering confirms the company's status as a full solutions provider.

*For more information on Magnum Rapid Intervention Vehicles please contact:*

Tel: +44 (0) 1493 417600

Fax: +44 (0) 1493 417700

Website: [www.ansul.com](http://www.ansul.com)

### NEW RECHARGEABLE SAFETY TORCH FROM WOLF

Wolf Safety, the leading manufacturer and supplier of torches and portable lighting for use in explosive atmospheres, has launched the first in its range of high-tech ATEX approved rechargeable torches.

The robust, yet compact, ergonomically designed torch weighing only 325g, a fraction of the weight of other competitive safety torches with a similar performance, incorporates a high efficiency 4-watt halogen bulb, offering two levels of light output and three to seven hours light duration.

State of battery charge is indicated

with a bar of high intensity red LEDs which go out one by one as the battery charge diminishes. Towards the end of discharge, the beam flashes off repeatedly, warning recharging is required.

Chargers are available with 'Quick' (2.5h) or 'Standard' (8h) charge rates, configured to run from vehicle voltages, or mains with a suitable transformer. A unique feature of the charger design is the single handed 'snap-in; snatch-out' torch holder, designed to give the dual function of secure torch retention but also quick release, ideal in emergency situations.



*Wolf Safety Lamps ATEX Rechargeable Safety Torch*

Wolf Safety's new Rechargeable Safety Torch, which is ATEX Approved for use in Zones 1 and 2 explosive gas and dust atmospheres, also carries *e ib IIC T4* approval code, which complies with Home Office TB1/1997 breathing apparatus for firefighters.

Low maintenance, quick component replacement, easy to use switching – even with gloved hands – and an IP67 rating, are other significant product benefits supporting the claim that this torch currently represents the best in rechargeable safety torch technology.

*For more information please contact the sales office:*

Tel: 0114 255 1051

Fax: 0114 255 7988

Email: [info@wolf-safety.co.uk](mailto:info@wolf-safety.co.uk)

Website: [www.wolf-safety.co.uk](http://www.wolf-safety.co.uk)

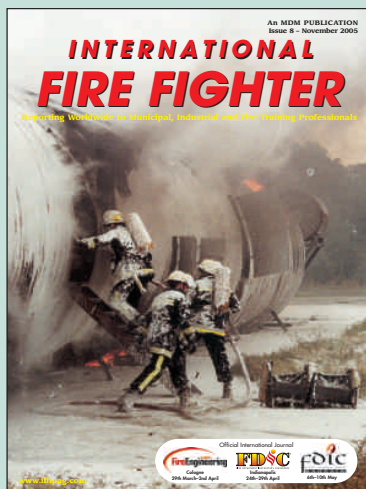




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